# Is the Service Charge of Gas Companies Equitable?

## A Study of Gas Rates

By Ralph Eugene Brown, B. B. A.

Submitted as a Master's Thesis

May 2, 1927.

## The Point of View

In pursuing the research program for the study of the Service Charge the writer has as far as practical applied the usual methods for business research. While there is a rather extensive bibliography on the subject of rates most of the material is of comparatively recent origin and prepared principally by the active executives in the industry. Due to the highly specialized and technical features of public utility work these articles are written for the technically trained executives and usually prepared to meet some special situation. With this fact in view the writer has collected for this work those articles which as far as possible deal with the principles underlying the rate systems. The bibliography submitted with this thesis is fairly representative of the articles which have stated the fundamental principles and made contributions to the subject.

The study, on the other hand, made of the cases on the Service Charge carried through the Courts and the reports of the various Public Utility Commissions represents the results of careful thought and discussion of the effect of the various rate systems on the public and their reactions to the introduction

of new rate forms. The opinions and orders of these bodies clearly recognize the fundamental principle that a public utility furnishes something in addition to the commodity which it manufactures and that the utility is entitled to separate in its rates the commodity charge from the charge for being ready to serve. From the legal point of view the equity of this separation is firmly established by the rulings of the Courts.

The writer has attempted in this thesis to prove the equity of the Service Charge from an accounting viewpoint and to show the method for the determinatioh of the scientific rate. During the period of study the theory for the determination of the scientific rate has been brought to the attention of the gas industry by the Rate Structure Committees of the American Gas Association.

In view of the fact that the theory of the scientific rate represents a further advancement in the fundamental principle that there is a separation between the commodity charge and the ready to serve charge for gas service the writer feels that it emphasizes the equity of the Service Charge from a cost accounting view point.

Is the Service Charge of Gas Companies Equitable?

A Study of Gas Rates

Outline

Introduction

I Brief History of the Gas Industry

1. Discovery by alchemists, 1609
2. The Gods of Gas
3. William Murdock, 1792
4. Frederick Albert Winsor, 1806
5. Samuel Clegg, 1815
6. First Gas Company in the United States,1816
7. The Boston Gas Light Company, 1822
8. Robert Wilhelm von Bunsen, 1855
9. Carl Auer "von Welsbach", 1884
10. Mantle Street Lighting, 1896

II. Functions of a Gas Company

1. Selling gas service
2. Operating Expenses
    a. Manufacturing the product
    b. Distributing the product
    c. Furnishing the service
3. Analyzing the expenses
    a. Output expenses
    b. Capacity or "maximum demand"
    c. Consumer expenses

III. Kinds of Rates Used

1. Flat Rate
2. Straight flat meter rate
3. Boston Sliding Scale Rate
4. Straight flat meter rate with discount for large quantities
5. Minimum charge rate
6. Step meter rate
7. Block meter rate
8. Service Charge rate
9. The Three Part Rate
10. The Scientific Rate

IV. Elements necessary in establishing a rate

1. Cost of manufacture
    a. Direct labor and material
    b. Maintenance of plant
2. Cost of delivering to the consumer the gas manufactured
    a. Demand or ready to serve costs
    b. Consumer charge costs
    c. Cost of capital employed

V. Tests of a gas rate

1. Is it just?
2. Is it reasonable?
3. Is it sufficient? (Confiscatory)
4. Is it discriminatory?
5. Is it preferential?
6. Is it practical?

V1. Basic Factors in determining rates

1. Manufacturing expenses vary with quantity sold
2. Expenses that vary with the number of consumers
3. The consumer controls the amount of gas used
4. The amount of gas varies with the consumers
5. The expenses of the company are the same for the large or small consumer
6. Expense is incurred whether service is used or not
7. Elements of Distribution Expense vary with the number of consumers

Discussion

I. How are gas rates determined?

1. Estimated expenses
    a. Manufacturing
    b. Distribution
2. Estimated consumption

II. Method of determining scientific rate

1. The cost analysis
    A. The cost of service basis
        1. Consumer Costs
        2. Demand Factor
        3. Diversity Factor
        4. Definition and discussion of terms used
            a. Consumer Costs
            b. Manufacturing Demand Costs
            c. Distribution Demand Costs
            d. Commodity Costs

e. Load Factors

1. Plant

2. Distribution

3. Consumer

a. Manufacturing

b. Distribution

B. Allocation of Costs

1. Operating Expenses

a. Manufacturing

b. Transmission and Distribution

c. Commercial

d. New Business

e. General and Miscellaneous

f. Taxes

g. Retirement Expenses

2. Working Capital

3. Fixed Capital

4. Rate Base

a. United States Supreme Court

b. Massachusetts Courts

5. Rate of Return

2. Analysis of Gas Consumers

a. Steps of consumption

b. Classes of consumers

c. The unprofitable consumer

d. The profitable consumer

III. Application of Service Charge Rate

1. Determination of a scientific rate

a. Survey

b. Statistical Data

c. Tabulations

2. How the rate effects consumers

a. The unprofitable consumer

b. The profitable consumer

IV. What the service charge really is?

1. An adjustment of costs between consumers

2. Does the company benefit directly by the service charge?

V. Legal opinions on the equity of the service charge

1. Three Part Rate Upheld

VI. Objections to the service charge

1. Is the service charge a meter rental?

2. Does the service charge result in an unjust discrimination?

a. Rate applies equally and impartially to all consumers

b. Rate varies with the number of consumers

c. Rate represents the cost of service rendered.

VII. What the public thinks of the service charge

1. A direct tax

2. It is not a part of the rate for gas

3. It increases the gas bills

4. It provides additional revenue for the company

## Conclusion

I. What the service charge accomplishes?

1. Makes the small consumer pay his fixed cost

2. Encourages increased consumption

3. Lowers the rate for the large consumers

II. A prediction for the future

## Sources of Information

I. Bibliography

II. Correspondence

III. Conferences

IV. Cases and Reports on the Service Charge

V. Information Service of the American Gas Association

# Is the Service Charge of Gas Companies Equitable?

## A Study of Gas Rates

Part One. Introduction

Part Two. Discussion

Part Three. Conclusion

Part Four. Sources of Information

## Part One

## Introduction

In Part One the writer has attempted to discuss in non technical language the entire rate structure problem of gas companies. The historical review shows that the industry is relatively old and that flat meter rates are firmly established as the basis for charging for gas service. The functions of the gas company are next discussed. In the discussion of the kinds of rates used the development of the various rate structures are taken in the order of their introduction in the industry.

The next point discussed is the elements necessary in establishing a rate. When the form of rate is once determined the necessary tests that the rate adopted must pass is next discussed. The practical test is the most difficult one that a scientific rate has to meet due to the conservative viewpoint of the gas company officials and the fact that the public thinks a flat meter rate is a just and fair rate.

In the discussion of the basic factors in determining rates the fundamental principles of the Service Charge are stated and the fact that certain expenses of being ready to serve are incurred whether any gas is used or not is established.

Part One

Introduction

Is the Service Charge of Gas Companies Equitable?

## Introduction

The question of rates and the present rate situation is closely interwoven with the history of the gas industry. We sometimes do not realize that the gas industry is the oldest of the public utility organizations and its history with respect to the period uses of gas service and the method of charging for this service has a very definite and irrevocable effect upon the attitude of the general public towards its rates.

It is only within the last ten years that the managers of gas companies have given serious consideration to the correct and scientific determination of proper and equitable rates for the service the gas company is ready and willing to render at all times.

Discovery by Alchemists

The old alchemists in their search for the Philosopher's Stone incidently discovered gas. The actual naming of gas is attributed to John Baptist van Helmont in 1609 who in the course of his experiments found that it was one of the products of the combustion of coal. The word itself comes from "Geist" which in German means "ghost".

Natural gas was, however, known to the ancient people. The story of how "gas became the Oracle of the Gods" is interesting. One day a Greek boy looking after his goats noticed that they became giddy whenever they were near a certain spot. He went to the spot himself and noticed that whatever rose from the ground made him light headed and talkative. In great excitement he ran to the village and told of his discovery. The villagers went to the spot and concluded, due to their superstitious beliefs, that there must be a god living at this place. They later appointed a priestess to converse with this god, and also built a temple where persons might go for advice, provided they brought gifts to the god. This is how and why the Temple and Oracle of Delphi became famous. '

' Romance of the Gas Industry, O. E. Norman, page 17

The Gods of Gas

It might be said that the word Gas is made up of the first letters of the names of three gods worshipped by the ancient East Indians, namely:

G - from Ganesa, the god of wisdom and remover of obstacles. The God Ganesa has been with Gas from the beginning and during these years he has so ruled the minds of men that much wisdom has been shown in removing obstacles and making Gas the important servant in the twentieth century home.

A - from Agni, the god of fire. Through the teachings of Agni, Gas has risen to the highest pinnacle in the realm of Heat.

S - from Surya, the sun god. Through the God Surya, Gas has obtained the power of Light to make more happy the lives of men and to make disappear the recesses of Darkness. '

Natural gas was first confined in beef bladders. Between 1660 and 1670 Dr. Clayton, a rector of Crofton, in Yorkshire, experimented with natural gas. He set a man to dig the ground of Wigan and found at a depth of half a yard a "shelly coal". This he heated in a closed vessel and collected the gas given off in bladders. He amused his friends by pricking holes in the bladders with a pin and lighting the colorless gas with a candle. ''

' Home Beautiful Exposition Bulletin, April 20, 1923.

William Murdock

A hundred years later another Englishman began to experiment with various kinds of gases with the idea of putting them to practical uses. This man, William Murdock, can be truly named the inventive father of gas light in England. In 1792 he conducted gas through seventy feet of tinned iron and copper tubes to light his house and grounds thus using gas for the first time for a practical purpose.

In 1805 Murdock built a gas works and lighted the cotton mill of Messrs Phillips and Lee at Manchester with 900 burners.

Frederick Albert Winsor

About this time a German by the name of Frederick Albert Winsor heard of the experiments of Lebon, a Frenchman, in making gas by distilling coal or wood. Winsor became intensely interested in gas for lighting and quickly realized its great possibilities. He advocated the distribution of gas from a central source and proposed the organization of a company for the manufacture of gas. He obtained the first English patent for gas making purposes, May 18, 1804 and prophesied a universal use of gas for lighting, heating, power, and in the chemical arts.

Winsor in spite of great opposition managed to raise money and organize a company. In 1806 he laid leaden pipes in Pall Mall, these being the first gas mains laid in a public street.

Finally he applied to Parliament for permission to form the London and Westminster Gas Light and Coke Company and an Act of Incorporation was granted in 1810. In April, 1812, this company was granted a Royal charter thus becoming the first gas company in the world. '

Samuel Clegg

The next step in the development of the gas industry was the invention by Samuel Clegg, a pupil of Murdock, in December, 1815 of the first gas meter. Due to many causes the development of the gas industry has been very slow and the rate problem as today presented to all public utilities did not begin to be a vital question until practically a hundred years later.

At this time and for a considerable period the manufacture of gas was confined to lighting exclusively. During this period there were no gas meters, the charge being based upon estimated consumption. This estimate was usually determined by the number of burners and the period of use. Incidentally the price of gas was 15 shillings a 1,000 cubic feet.''

' Romance of the Gas Industry, O. E. Norman, page 32 &33
''Romance of the Gas Industry, O. E. Norman, page 44

During the time that the pioneers Murdock, Winsor, and Clegg were working out the manufacture of gas in England David Melville introduced gas lighting in Newport in 1812.

The First Gas Company in the United States

Rembrandt Peale holds the same relation to the gas industry in the United States as Frederick Winsor does in England. In June, 1816 he gave a successful exhibition of gas lighting in Baltimore. As a result of this exhibition an ordinance was passed on June 17, 1816 permitting Peale and others to manufacture gas, lay pipes in the streets, and to contract with the city for street lighting. This company was the first gas company founded in the United States and it was incorporated under the laws of Maryland on February 5, 1817 as the Gas Light Company of Baltimore. '

On July 15, 1822 gas lighting was introduced in Boston in a drug store of Mr. Bacon on Court Street. On August 19, 1822 Alexander Parris and fourteen others petitioned the Aldermen of Boston for authority to lay pipes in Boston which shall have a maximum diameter of three inches. This petition was referred to a special committee who made a report on August 27 advising that it be allowed with one or two suitable restrictions.

Romance of the Gas Industry, O. E. Norman, page 44

The same day the Aldermen granted the association the right to lay pipes under the sidewalk, "provided that the bricks shall be taken up under the supervision of the Commissioners of the Highways and at the expense of the Association." In this way the first public utility law was passed and it was the beginning of the regulation of public utility companies by the state.[1]

The precedent established by this law is far reaching and the importance of the regulation of all public utility companies by state commissions can not be over emphasized. The general public does not always realize or know that the public utilities are regulated by men in public office who are appointed by the representatives of the people elected by them. All the records of the companies are open to inspection by the state commission, no changes in rates can be made without permission of the commission, no change in the method of conducting the business can be made without approval, the meters and piping installations must be passed by the state inspectors, and the accounts must be kept in the manner promulgated by the commission.

On October 31, 1822 the City Gas Company as it was then called established their works and were ready to distribute gas for lighting.

[1] 100 Years of Gas Lighting, J. E. King, Boston Transcript December 28, 1921.

The Boston Gas Light Company

The next step in the development of the company was the)granting on January 22, 1823 of a state charter by the General Court on the petition of William Prescott, Alexander Parris, Bryant P. Tilden, Nathan Hale, and John C. Gray as incorporators to the Boston Gas Light Company, allowing it a capital not to exceed $75,000, and affirming the company's right with the assent of the mayor and aldermen of Boston, to lay pipes in this city's streets.'

Gas was first sold in Boston according to the number of burners installed or at so many dollars per month according to the size of the pipe which entered the consumer's premises. This was not a satisfactory or profitable method of distributing gas and led to many abuses which are obvious.

Although the gas meter was invented in England in 1815 the meters were not manufactured in the United States until 1832. The Boston Meter Works was organized in 1849 and finally after many controversies the modern and accurate state tested meter was evolved placing the gas industry on a sound economic basis.

'100 Years of Gas Lighting, J. E. King, Boston Transcript, December 28, 1921.

Robert Wilhelm von Bunsen

In closing this brief historical review of the beginnings of the gas industry ' mention must be made of two prominent German chemists who made possible the utilization of gas for lighting and heating purposes. Robert Wilhelm von Bunsen invented the Bunsen burner. The invention of this burner made it possible to burn coal gas economically with an intensely hot but smokeless flame. ''

Carl Auer "von Welsbach"

Among the scholars who came from all parts of the world to study under Bunsen at Heidelberg was Carl Auer. In the course of some experiments in Bunsen's laboratory he discovered accidentally that certain rare earths glowed brightly when introduced in the flame of a gas burner. This discovery led him to apply oxides of cerium and thorium to a cotton webbing thus producing the modern Welsbach mantle in 1884. '''

This mantle was applied to street lighting in 1896.

' For Some Important dates in the Gas Industry see Appendix A

'' Romance of the Gas Industry, O. E. Norman, page 53

''' The University Encyclopedia, page 7021

## II. Functions of a Gas Company

A gas company supplies their consumers with a very necessary service. It is a type of corporation known as a public service corporation. Other public service corporations are the power, electric, telephone, telegraph, and transportation companies. Due to the fact that all of the public service corporations are under the supervision and regulation of state commissions they are more commonly known as "public utilities".

### Selling Gas Service

The one thing that differentiates a public utility corporation from the manufacturing and trading corporations is the fact that it supplies on demand a necessary service. The general public uses this service at all times and does not appreciate the fact until some trouble develops that temporarily prevents the utility from functioning properly and brings forcibly to their attention how important and necessary the utility is to their safety and protection.

In the hundred years that gas companies have rendered public service there has been few interruptions. In the rare instances that are on record of an interruption to gas service the cause was always due to some condition which made it

impossible to continue operations. The cessation of service in these instances has never been due to financial conditions for a public utility, from its very nature and purpose, is compelled, as no private corporation would, to supply service even at a loss. The gas industry of today represents the culmination of the vision of the early pioneers who although they made no profit, and were subject to public opposition, remained true to their vision and began the principle of supplying, under all conditions, a service which never fails. The gas industry has through past performances truly earned the name of semper fidelis - always faithful.

## Operating Expenses

A gas company manufactures and distributes gas. This statement is a fundamental one and is the basic principle of a scientific rate structure. Gas is not a commodity that can be taken away by a customer in a bag, basket, or other receptacle.from a central point. The gas company must provide means to carry the commodity which it sells, gas service, to the consumer's premises many miles away from its gas works or holders.

When a customer purchases a commodity at a department or grocery store the transaction is completed in practically all cases when the goods are delivered. The mercantile concern is not obliged

to provide each of its customers with a stock of merchandise and be ready at all times to supply in any amount the commodities which they desire on their own premises. It is not necessary for the mercantile concern to provide an elaborate and expensive distribution system.

### Manufacturing the Product

A gas company's operating expenses may be broadly divided into three classes or functions. The first class are those expenses that have to do with the actual costs of manufacturing. This class is the same as for any manufacturing business and can be divided into the three elements of cost, namely, raw material, direct labor, and overhead. It might be mentioned that if it was practical for a consumer to go to the gas works and obtain his daily amount of gas at the source of supply it would be possible to sell the gas at the actual cost of manufacture.

### Distributing the Product

The second class of operating expenses are those that have to do with the distribution of the gas to the consumer's meter. This class of expenses include the services of expert and trained workmen to inspect and keep in repair the mains, pumps, serxice pipes, meters, and appliances. These men

must be in readiness to go to a point of trouble at any hour of the day and night in order to give the consumer the service which he demands. Meter readers must call each month at the consumer's premises to read the meter, the bills must be prepared and a collector call at the consumer's home to collect the bill, and elaborate bookkeeping records must be kept showing the meter readings, the consumption, the amount of the bill, and the date paid. Information bureaus and experimental laboratories must be maintained to test new gas appliances in order to determine the most economical and efficient appliances to recommend to the public. In the latest developments of gas for industrial purposes experienced corps of gas engineers and heat treating experts must be maintained with special equipment and laboratories to experiment with new problems as applied to all types of manufacturing and the improvement of present gas installations to meet the demands of modern science.

The slogans adopted by the American Gas Association composed of leading gas companies and the men interested in its development that

"If its Done with Heat You Can do it Better with Gas"

and

"Gas has a Thousand Uses"

illustrates the viewpoint of the modern and progressive gas executive. In this connection a few of the many and everyday uses of gas for industrial purposes might be mentioned; "baking and candy making, coffee roasting, smoking meat, pasteurizing milk, glass melting, china decorating, hat shaping, shoe drying, clothes pressing, cigar lighters, barber boilers, vulcanizing, lumber drying, tinning, varnish boilers, rivet heaters, forging, brass melting, galvanizing, coloring and rust proofing metal, welding and cutting metal, melting type, foundries, etc. etc. " [1]

Furnishing the Service

The third class of operating expenses has to do with those expenses that are necessary to give the consumer the amount of gas he requires at the time he desires to use it. The gas company must maintain the supply of gas so that all the consumers can use as much as they require; the gas company must have a manufacturing plant sufficient in size with its holders to meet the demands of all of its consumers; the gas company must maintain the gas at a certain pressure in all its holders, mains, and services; the gas company must manufacture a gas that has a certain heating value. This heating value standard is established by the state department of public utilities and the gas company must

[1] Romance of the Gas Industry, O. E. Norman, page 128

manufacture gas that will give this heat standard, with a slight variation, at all times. In the modern gas plant the gas manufactured is tested every hour by expert chemists in the laboratory to see that the product is meeting the standard. State inspectors are constantly performing special tests and if a gas company's product falls below the standard a heavy fine must be paid to the state.

All expenses of this type have to do with the service which the gas company must furnish. These expenses are in addition to those expenses that have to do with the cost of manufacturing the product and providing the consumer with the facilities to use the gas. All public utility corporations have the same three general classes of operating expenses. It is easily seen that the expenses incurred in connection with distributing the product and furnishing the service are expenses that have nothing to do with the actual expenses of manufacturing the product but are necessary in order for the gas company to make and keep its gas service efficient, economical, safe, and acceptable to its consumers.

Analyzing the Expenses

From this general grouping of operating expenses into three classes or functions the next step is to take specific expenses and determine into which group the expense should be placed.

For this purpose the general proposition is stated that the expenses of a gas company fall into three technical groups, the amount of expense incurred under each group in a given period depending on, and varyingwith, different factors. '

Output '' Expenses

Those operating expenses that have to do with the actual manufacturing of gas are known as output expenses. The controlling factor in this group of expenses is the cost of manufacturing the number of cubic feet of gas actually furnished to the company's consumers as shown by the readings of the consumer's meters. This class of expense represents the direct material and direct labor cost as shown in the manufacturing statement of the usual manufacturing company.

' The Service Charge as a Part of the Rate for Gas

W. L. Ransom, page 6

'' Definition as given by "Rate Structure Committee of the Peoples Gas Light and Coke Company, 1915" "The term "Output" represents the quantity of gas in cubic feet produced by the company and consumed by the customers and measured irrespective of the time rate at which the quantity was produced or consumer."

In a general way a large output reduces the unit cost of manufacture per cubic foot and a small output increases the unit cost of manufacture other factors remaining constant.

Capacity or "Maximum Demand" ' Expenses

Those expenses that have to do with being ready to supply all the gas company's consumers with gas in the quantity and at the time the consumer desires it are known as capacity or demand expenses. The controlling factor is the total amount of gas which the company must keep its plant and facilities adequate and ready to supply at a given time should the consumers call for it all at the same time.

A gas company is different from the usual manufacturing concern in as much as gas cannot be manufactured during the dull periods and stored for long periods to meet the greater demands during the busy time of the year. In a general way the kind of weather has a decided effect upon the amount of gas required by the consumers. Gas manufacturing is a continuous process; the generating house, as it is called, operating upon a twenty four hour basis. The gas is being constantly manufactured and stored in the holders ready for pumping to the consumer's

' Definition as given by L. R. Dutton in "Gas Service Costs in a Rate Structure"
" Demand may be defined as the greatest quantity of gas that may be called for by all customers during any hour but which should be observed in 10 to 15 minute periods."

meters. The company must provide generating equipment sufficient to take care of three days output or in other words to keep its holders full of gas at all times.

Consumer ' Expenses

Those expenses which have to do with distribution expenses and incidental expenses incurred by the company in order to give the consumer the service he demands are known as consumer expenses.

In the gas industry an attempt has been made to determine those expenses which vary with the number of consumers and to establish as part of the rate a separate monthly charge for those expenses at the same time reducing the rate for gas consumed.

III. Kinds of Rates Used

At the present time, in the gas industry, many different kinds of rates are used due to the fact that the industry is over one hundred years old and to the fact that only in recent years has any attempt been made to determine the costs of production and allocate them equitably among the consumers. The rates

' Definition as given by W. L. Ransom "The Service Charge as a Part of the Rate for Gas " page 6. "Consumer expense is made up of the various items of distribution expense and incidental service; the gross amount of these items depending on the number of consumers rather than the quantity of gas sold to a given consumer or to all consumers."

were established ' long before any knowledge of cost accounting as it is deveboped today into an accurate science.

Gas companies have discovered by cost analyses that as was true in other businesses'' a great proportion of their consumers were unprofitable at the present rates and that in order to grow rates must be revised on a scientific cost basis.

1. Flat Rate

The first rate used in the gas industry was by contract. This type of rate was used before the invention of the gas meter in 1815. It was determined by the number of burners which a consumer had and the number of hours he contracted to use the burners each night. An inspector would call at the consumer's residence to see that the burners were turned off at the proper time and shut off the gas supply from the street.

' "Thoughts on Rate Making" R. B. Brown. Volume IV Number 8- American Gas Association Monthly, page 465 " Gas rates were brought to an established basis generations before any real knowledge of cost accounting had been developed"

'' "Cost Accounting" Nicholson and Rohrbach, page 3 " Government investigations show that out of a quarter of a million business corporations in this country the majority are making no profit, and that over 70 % are making less than the salary of a good executive; furthermore, these statistics show that only 5 % of the manufacturers know what their goods cost them to make."

2. Straight Flat Meter Rate

With the introduction of the gas meter [I] an attempt was made to charge a certain sum for the rental [II] of the meter in addition to a rate for the consumption of gas. It is interesting to note at this point that the meter was only used where the consumers did not want to have the inspectors call to shut off their gas supply and were willing to pay for the use of the meter in addition to the regular consumption charge. [III]

At the same time the fundamental proposition was established that there were cost elements in furnishing gas service that had nothing to do with the actual cost of manufacturing the gas. It was established beyond question that a gas company had to furnish a service in addition to the commodity which it sells and that this service was in direct contrast to that of a factory or store delivering merchandise. There was a long and bitter struggle to introduce the gas meter due to the attitude of the public but it was finally established as the method of measurement for gas consumed.

In the United States due to the regulation of gas companies by the public utilities commissions the meter was introduced without the use of the

For Further References:

[I] Appendix A

[II] Appendix A

[III] Appendix B

With the introduction of the gas meter an attempt was made to charge a certain sum for the rental of the meter in addition to a rate for the consumption of gas. It is interesting to note at this point that the meter was only used where the consumers did not want to have the inspectors call to shut off their gas supply and were willing to pay for the use of the meter in addition to the regular consumption charge.

At the same time the fundamental proposition was established that there were cost elements in furnishing gas service that had nothing to do with the actual cost of manufacturing the gas. It was established beyond question that a gas company had to furnish a service in addition to the commodity which it sells and that this service was in direct contrast to that of a factory or store delivering merchandise. There was a long and bitter struggle to introduce the gas meter due to the attitude of the public but it was finally established as the method of measurement for gas consumed.

In the United States due to the regulation of gas companies by the public utilities commissions the meter was introduced without the use of [illegible]

meter rental charge. While state commissions recognize that there should be a minimum charge for gas used they refuse to allow a meter rental charge of which more willbe said in the discussion to follow.

When the gas meter was first introduced the principle use for gas was lighting and the rate developed was known as the "uniform meter rate." '

3. Boston Sliding Scale Rate

When the gas was used only for lighting this type of rate was equitable and is still in use by many large companies. It is interesting to note that the rate of the Boston Consolidated Gas Company is a straight flat meter rate. This company is the only one in the country operating under what is known as the London or Boston sliding scale. The Boston sliding scale was adopted from the London sliding scale rate in 1906. The general operation of this scale is devised to effect an automatic adjustment of rates by an adjustment between the rate of dividends paid to stockholders and the rate for gas. By statute a standard price for gas was

'Definition as given by W. L. Ransom " The Service Charge as a Part of the Rate for Gas" page 8
" In other words, it is a rate under which each consumer pays for his gas service the same sum of money for each thousand cubic feet of gas he actually consumes; the rate is uniform regardless of the quantity he uses or his maximum demand upon the capacity of the plant within a given period, and all costs of the service are covered by the rate per thousand."

fixed, a standard dividend rate determined, and the sliding scale ratio established. ' The sliding scale works on the basis that for a reduction of five cents per 1,000 cubic feetof gas from the standard price agreedupon the dividend rate is automatically increased one per cent and with a corresponding increase above the standard price the dividend rate is reduced.

With the development by the inventors of gas burners for cooking and water heating the keen competition of gas for supremacy over the solid fuels began. With a view to increasing the volume of gas sales the gas companies decided to allow special rates for those consumers who decided to use gas for fuel during the day time. In order to measure the gas that was sold during the day a separate meter was installed so that a consumer had two meters,'' one for the gas used during the day, which was sold at a comparatively low rate, and one for the gas used at night, which was charged at the regular flat meter rate.

'

''Definition as given by L. R. Dutton,"Gas Service Costs in a Rate Structure(Revised)" American Gas Association Monthly Volume III Number 11. page 582 "The gas that was furnished for fuel did not require any large capital outlay in plant or mains, very little more labor to operate the plant, and the largest additional cost was for gas making material. It was determined to make a mich lower rate for gas sold for fuel in the day time and to install a separate meter to measure the gas used."

About this same time the mantle light was perfected so that the amount of gas used for lighting purposes was greatly reduced. This made it impractical to allow each consumer to have two meters and the next step was the introduction of the minimum charge rate, permitting the consumer to use a small quantity of gas to be included in the rate and the recognition that the quantity of gas used by a consumer should be reflected in the rate charged.

4. Straight Flat Meter Rate with Discount for Large Quantities

At this point the original flat meter rate was divided into three parts and this is the type of rate that is used at present in the majority of the gas companies. The rate structure is usually constructed in such a way that the three types of flat rates are combined and a part of each rate is applied to each class of consumers. The way in which the straight flat meter rate with discount for large quantities ' operates is that the large consumers who use gas for industrial purposes are given an automatic reduction in the rate per thousand feet as their consumption reaches the

' Definition as given by S. S. Wyer in "Elimination of Discrimination in Public Utility Rates by "Readiness-to-Serve' Charges" page 9
" Meter Rate with quantity discount - That is, the price will be decreased as the consumption or quantity used is increased."

minimum. While this type of rate gives an advantage to the large consumers it is manifestly unfair to the smaller consumers whose requirements do not exceed the minimum.

5. Minimum Charge Rate

The third part of the flat meter rate structure is known as the minimum charge rate.' Public Utility Commissions have in all parts of the country passed rulings as to the amount of the minimum charge which the gas companies under their jurisdiction are allowed to charge. These rulings of the Commissions recognize the fundamental fact that the gas companies are obliged to incur a certain expense in installing a meter for a consumer and being ready to supply him with service if he so desires. In Massachusetts the minimum charge is fixed by statute at seven dollars per year or as is usually charged fifty cents a month for use of meter.'' The minimum charge operates in such a way that the consumer is allowed to use gas up to the amount of the minimum charge, if his consumption exceeds the minimum charge it is

' Definition as given by W. L. Ransom in "The Service Charge as a Part of the Rate for Gas" page 10
" A "minimum charge" is a regulation under which each consumer pays at least a given sum per month, irrespective whether he uses the amount of gas calling for the payment of that sum, calculated at a "flat rate."

'' Chapter 164 - General Law of 1921 - Section 119
" No charge shall be made by a corporation furnishing electricity for lighting purposes or gas for the use of a meter during any portion of twelve consecutive months, if the consumer during that time uses electricity to the value of nine dollars or gas to the value of seven dollars, and whoever makes a charge therefor contrary to this section shall be punished by a fine not exceeding one hundred dollars."

absorbed and he pays a bill for the gas consumed figured at the regular rates. If he uses less than the minimum consumption he pays the amount of the minimum charge and at the same time has the use of what gas he desires for his needs.

6. Step Meter Rate

The stage of development which many gas companies are at present experiencing is the change from the system of flat meter rates to a graduated rate' or system of rates with a minimum charge for the smaller consumers. The graduated rate attempts to reduce the price charge per unit as the consumption increases and by this method induce the consumers to use more gas in order to obtain a lower rate per unit. There are many factors used in establishing the basis for this form of rate due to local conditions but in all cases some consideration is given to the three factors of operating expense, namely:

a. Quantity

b. Demand

c. Consumer Expense

There are two forms of graduated rate used

' Definition as given by W. L. Ransom in "The Service Charge as a Part of the Rate for Gas" page 8

"Under a "graduated" rate, the same price for gas service is not charged to all consumers, if the charge may be recomputed in terms of a price per unit of gas actually metered; but such price per unit varies according to the quantity used, the circumstances of use, the maximum demand within a given period, the allocation of the consumer costs on a "per consumer" basis, or other factors differentiating the conditions of service and the just apportionment of the costs thereof"

where the rate is based upon quantity consumed. The first form known as the step rate' has not been used to any great extent in the gas industry due to the fact that variations in demand are taken care of through the gas holder and do not become of such great importance as in the electric industry, where the manufacturing and generating problem requires additional sets of equipment to take care of the demand factor. The manner in which a step schedule operates is to charge a certain rate for the first five thousand cubic feet; if the consumer during the month uses between five thousand cubic feet and twenty thousand cubic feet the rate for the month per thousand cubic feet is reduced: if over twenty thousand cubic feet is consumed during the month the rate per thousand cubic feet is further reduced and the bill is figured on the reduced rate basis. A step schedule operates to the advantage of the large industrial consumer and gives him every incentive to increase his consumption to the maximum in order to take advantage of the lowest rate. Incidently when this type of consumer reaches the maximum he is paying for his gas at the actual operating cost and is thus saving the other costs that are used in determining the rates for the lower consumption units.

'Definition as given by W. L. Ransom in "The Service Charge as a Part of the Rate for Gas" page 9 "A "step" rate, under which a certain specified price per unit is charged for all or any part of a specified number of units, with reductions in the price per unit based upon increases in the number of units , according to a given schedule."

7. Block Meter Rate

The second form of graduated rate based on quantity consumed is known as the block meter rate'. The way in which this block schedule operates using the same figures as given under the step rate schedule illustration in the preceding section would be to compute the first block of five thousand cubic feet at one rate per thousand; the second block of ten thousand cubic feet at a lower rate per thousand; and all gas used in excess of the fifteen thousand cubic feet block at a still lower rate per thousand cubic feet. In rendering a consumer a bill under a block rate schedule the consumption is analyzed according to blocks and each block is computed as a separate bill and then added together to obtain the total amount of the bill for the month.

A block rate schedule is rather complicated and difficult to explain to the average consumer but by careful study and analysis the blocks can be so graduated and the unit rate arranged so that in the first few blocks many of the demand and consumer costs can be included. In this way some of the practical objections to the service charge form of rate can be

'Definition as given by W. L. Ransom in "The Service Charge as a Part of the Rate for Gas" page 9 "A block rate, under which a certain specified price per unit is charged for all or any part of a "block" of such units, and reduced prices per unit are charged for all or any part of succeeding "blocks" of the same or a different number of such units. Each such reduced price per unit applies only to a particular "block" or portion thereof."

avoided and the charge collected in the first few blocks' of a block rate schedule to which more will be said in the discussion to follow.

Service Charge Rate

The first great step in the development of equitable and scientific rates based on actual costs of operating a gas company was the introduction of the service charge form of rate. This type of rate is a natural development of the graduated rate schedule as exemplified by the step and block rates. The service charge however is not based on the quantity or demand elements in the operating costs, but on the third and more difficult element to explain namely consumer cost'' or those costs which are directly applicable to each consumer as a class irrespective of his consumption of gas or the time in which he demands the greatest service of the company. The service charge form of rate attempts to make each consumer pay his share of the costs he incurs by requesting the company to connect his inside service to a meter and furnish him with gas from the company's

' W. L. Ransom in "The Service Charge as a Part of the Rate for Gas" page 9
In a block schedule "for example, a rate of fifteen cents per hundred is charged for the first five hundred cubic feet of gas consumed by any consumer. No matter how much gas a given consumer actually uses he pays fifteen cents per hundred for the first five hundred cubic feet of gas which he uses."
'' From the same source page 9
" The "service charge" form of rates introduces a gradation based, not on quantity or demand, but on the third element, viz, consumer costs, which this form of rate distributes per consumer or per meter, rather than per unit of quantity actually consumed."

street mains. This charge is fixed for each consumer and does not vary with the quantity of gas consumed as in a block rate schedule. Every consumer pays the same amount each year and thus has the opportunity of paying for his gas consumed at a rate which covers the cost of manufacture. He is not obliged, as in a flat rate, to pay the consumer costs of those consumers who use no gas or very little gas.

9. The Three Part Rate

The service charge form of rate is known as a two part rate because it is composed of two parts, namely the rate for the actual gas consumed during the month and the fixed amount based upon consumer costs. In the gas industry Mr. Henry L. Doherty, a leader in the development of scientific rates, has introduced a rate known as a three part rate.[1] This type of rate is the further development of the service charge in that a definite part of the rate structure is based upon consumer and demand expenses. The first part of the rate is the usual service charge based upon consumer costs and the same for all consumers; the second part is a uniform charge per unit of demand; and the third part is a fixed rate for

[1]Definition by J. M. Spitzglass in "Rates for Public Utilities Service." "This system recognizes the fact that a part of the expenses is incurred as a result of acquiring merely a number of customers; another part by providing for the possible demand or capacity of those customers; and a third part by the amount of product actually supplied to the customers."

the consumption of gas. This type of rate structure makes it possible to charge as the consumption part of the rate the lowest amount that will cover operating costs and further gives the same consumption rate to every consumer whether he is the large industrial consumer or the small convenience and emergency consumer.

IV. Elements Necessary in Establishing a Rate

The trading and manufacturing corporations have an entirely different problem from the public utility corporations in the determination of the price at which they will sell or manufacture the commodities which they are offering to the public. The trading corporation in determining the price to sell a certain commodity usually knows in advance just what amount to charge in order to obtain a profit from thetransaction. The commodity costs a certain amount per unit and to this unit cost is added an estimated percentage based upon past experience which will cover operating and general administration expenses. With these two sets of figures the per cent of profit desired can be decided and the goods increased by that percentage to obtain the actual selling price. The manufacturing corporation likewise knows its price of raw material, its cost of direct labor, and its estimated overhead. With these three elements the cost of manufacture of any individual unit can be determined. With this amount the price to the buyer can be made so as to reflect

any amount of return desired. In a general way prices in both of these types of business corporations are determined by competition and the price at which the general public will buy the merchandise.

The method of determining the rate for a public utility is entirely different. In the first place a public utility does not make a profit in the same sense that a trading or manufacturing corporation makes a profit from its sales or from its manufacturing operations. Due to the fact that the general public believes that all public utilities are monopolies and that they make enormous profits it is difficult to explain the real situation

A public utility earns by its system of rates a revenue which is used to pay its operating expenses, in general, and a certain dividend to its investors. The rate that a consumer pays per thousand cubic feet is the method of raising the desired revenue. All public utilities are under the regulation of a public service commission of each state whose chief function is to see that the public is properly protected in its dealings with the public utilities. The rates as determined by the companies are approved by these commissions and if the rates established are excessive an appeal to the commissions will result in an impartial investigation and decision in regard to the whole situation. If a rate charged by a public utility is found to be more than is necessary to meet

the expenses of conducting the business these commissions have the authority to change the rate so that only the desired revenue will be earned.

The simplest way in which a rate can be determined is to estimate the expenses for the year including depreciation, taxes, adequate return, etc. and divide this estimated amount by the total estimated consumption as determined by past experience. The resulting figure is the flat rate ' which will raise the desired revenue to meet the expenses of the utility.

It is quite generally recognized throughout the entire gas industry that the flat rate system is inequitable; since each consumer pays the same rate per thousand cubic feet; detrimental to the growth of the industry since it does not have the tendency to increase the consumption of each individual consumer; and therefore, not conducive to the reduction of costs which is the ultimate goal of all scientific rate structures.

In a general way the public service commissions recognized the inequity of a flat rate structure by the introduction of a minimum bill charge. During the war due to increasing costs of coal, oil, and labor the commissions made the next great step towards

' W. L. Ransom in "The Service Charge as a Part of the Rate for Gas" page 8
"A flat rate is that computed by dividing the total amount in money of the revenues required to be earned to defray expense, by the number of cubic feet of gas sold."

equitable rates by substituting the service charge form of rate for the minimum bill. The first service charge rates introduced were equal for all consumers and in no way were graduated to meet the cost of service for each class of consumer. A block or step rate as permitted by the commissions in a general way recognizes the factors of cost of service but they do not make a definite specific separation between commodity charges and ready to serve charges or demand charges.

The broad fundamental principles stated by the pioneers of the gas industry for a rate structure are quite generally agreed upon as being divided into three elements:

1. Cost of Manufacture

This element is the first class of expenses that a rate must take into consideration. It is divided into two general subdivisions which correspond to the scientific principles of cost accounting.' that can be applied to all types of business enterprises. The first subdivision includes the cost of labor, oil, coal, and various other materials required and used in making the gas at the manufacturing plant. The

'Nicholson and Rohrbach, "Cost Accounting" page 13 "Material, labor, and expenses are the three subdivisions of manufacturing costs which are known as the elements of costs. These elements may be grouped under the two following headings:
1. Direct charges
2. Indirect charges."

second subdivision includes all direct and indirect charges necessary to maintain the plant in adequate condition and capacity to meet the maximum demand of all consumers, with a sufficient reserve by the use of gas holders for any emergency or interruption in the generating equipment.

2. Cost of Delivering to the Consumer the Gas Manufactured

The second element that a rate must take into consideration is the cost of distributing the commodity manufactured to the consumer at his place of residence or business and rendering the service to him on his own premises. This second element includes the cost of meter reading, billing, collecting, maintenance of meters, maintenance of services, certain fixed charges directly applicable to the investment in meters, mains, and services, and a portion of all general and administrative expenses.

In the preparation of a rate structure this second element is divided into two technical groups known as "Demand or Ready to Serve Costs" and Consumer Charge Costs" which will be defined and separated in the discussion to follow,

3. Cost of Capital Employed

The third element in a rate structure is known as the cost of the capital employed or is in other words the rate of dividends which an investor should receive in return for his capital invested in the public utility. It is the amount which represents a

reasonable return upon the value of the property of the company used in the manufacturing and distributing of gas.

The third element in a rate structure is the one on which the greatest controversities as to the bases of valuation ' of public utility property has arisen. Many important legal cases have been carried through the state courts to the United States Supreme Court and the decisions of this court have in most cases tended to place the public utilities on a present value basis enabling them to extend and improve their service with the assurance that the investors will be protected by an adequate return in the form of dividends.

V. Tests of a Gas Rate

There are six tests that can be applied to any rate for public utility service. These tests are the ones that the public utility commissions usually subject a rate when a company applies for a new form of rate or an increase in the present rate.

' William G. Woolfolk in "The Preparation and Presentation of Rate Cases Before Commissions" American Gas Association Monthly Volume III page 657
"It is obvious that what the utility "has got to have" is:
a. A valuation which give due recognition to the present value of the property, and
b. A rate schedule which will produce sufficient revenue to cover:-
A fair return upon such valuation
An allowance for contingencies
The estimated operating expenses
The required amount for renewals and replacements."

1. Is it Just?

The first test that a gas rate must pass is the answer to the question, "Is it just?". The word "just" used in this sense means equitable. A rate to passbefore a board of public utility commissioners must be, in their opinion, equitable to the company and to the ultimate consumer. A rate to be equitable must be such a rate that each consumer will bear his part of the cost of the public utility being ready to serve him. '

2. Is it Reasonable?

The second test of a gas rate is the answer to the question "Is it reasonable?" This test goes to the basis of building up the rate structure. The three elements that must be reasonable in a rate are the expenses that are necessary to manufacture the gas, the expenses that are necessary to deliver the gas to the consumer on his premises, and the return upon the investment of the company in property and equipment for manufacturing and distributing the gas. The amount of these expenses should be fair '' and governed by the individual circumstances and conditions under which each company may operate.

' American Gas Association - Rate Sturcture, Report of 1921 Committee, page 4
"It cannot be justly denied that each customer of a public utility should adequately pay for what he gets."
''American Gas Association - Rate Structure- Report of 1923 Committee- Appendix F - Preparation of Rate Cases F. C. Hamilton, page 59.
"The first of these is the determination of the amount of money necessary to pay operating, maintenance and retirement expenses, and a fair return on the value of the property."

3. Is it Sufficient (Confiscatory)?

The third test of a gas rate is very important from the point of view of the gas executives, the public utility commissions, and the courts. The rate of a gas company must be sufficient to pay all expenses of operation and manufacture and also a fair rate of dividends so as to encourage investors to buy additional bonds and stocks in the utility so that the utility can expand and render greater and more complete service to its consumers. A gas rate must not be confiscatory. The rate should yield a fair return on money prudently and wisely invested and employed in the service of the public.

4. Is it Discriminatory?

The fourth test of a gas rate is the one that should interest the general public and the company. It is perhaps the most difficult of all tests in that practically all gas rates are discriminatory in some sense with the possible exception of the scientific three part rate. There is no question that the flat meter rate so common in the gas industry is discriminatory because each consumer pays the same rate per thousand cubic feet irrespective of when he demands service or how much gas he uses. The use of a discount for large quantities helps the large consumer but he still has to pay more than he should and the small consumer is obliged to pay more than his

share of the costs. The block and step rates make the rate more equitable among the larger consumers but with this type of rate structure the smaller consumer still pays more than his shar e of the costs.

The fundamental principle of the Service Charge Rate attempts to give each consumer a fixed amount to pay for those costs which all consumers incur as a group and a lower rate for consumption. The service charge rate thus becomes a step forward towards an equitable rate to all classes of consumers.

5. Is it Preferential?

The fifth test of a gas rate is that it must not be preferential towards any one group of consumers. Each consumer should bear his proper share of the costs of the enterprise and a small minority of the consumers should not pay more than their share of those costs in order to make up the difference caused by the majority of the consumers. A rate that is not preferential is one that is based on the cost of service rendered and one that makes each consumer pay his proper share of those costs which are directly applicable to him as a class.

6. Is it Practical?

The sixth test of a gas rate is perhaps the most important of all of the tests in that while a scientific rate can be determined accurately and meet the requirements of all theelements and tests of an

share of the costs. The block and step rates make the rate more equitable among the larger consumers but with this type of rate structure the smaller consumer still pays more than his share of the costs.

The fundamental principle of the Service Charge Rate attempts to give each consumer a fixed amount to pay for those costs which all consumers incur as a group and a lower rate for consumption. The service charge rate thus becomes a step forward towards an equitable rate to all classes of consumers.

3. Is it Preferential?

The fifth test of a gas rate is that it must not be preferential towards any one group of consumers. Each consumer should bear his proper share of the costs of the enterprise and a small minority of the consumers should not pay more than their share of those costs in order to take up the difference caused by the majority of the consumers. A rate that is not preferential is one that is based on the cost of service rendered and one that makes each consumer pay his proper share of those costs which are directly applicable to him as a class.

4. Is it Practical?

The sixth test of a gas rate is perhaps the most important of all of the tests in that while a scientific rate can be determined accurately and meet the requirements of all theoretical tests of an

equitable rate the public will refuse to accept it and will protest in such a manner that the company will be obliged to change the new rate structure in such a way as to conceal the real rates from the public.

The practical test is the one that the Service Charge form of rate can not pass although the public utility commission will approve and give a company the right to introduce this form of rate.

Due to the fact that the gas industry is so old and to the fact that the managers have always been conservative and slow to adopt changes the general public feels that a flat rate is the proper rate for gas service. In order for a gas company to introduce successfully a form of rate structure along the scientific allocations of costs to be explained in the discussion to follow the public must be educated to the real conditions and to the costs for each group of consumers that a gas company must serve. Due to the fact that a gas company is considered a monopoly' and is the only company granted a franchise in the city to operate it is greatly handicapped by the press and political influence. While it is true that a gas company is a monopoly in the sense of being

'American Gas Association - Rate Structure - Report of 1921 Committee - page 4
"The gas industry is looked upon generally by the public as a monopoly, but it is a Gas Monopoly only, and is not a Fuel and Lighting Monopoly."

the only company permitted to manufacture and distribute gas it is not the only company that sells lighting and fuel service. During the past five years the keen competition from the electric and oil fuel companies have plainly demonstrated this proposition to the gas companies until today the managers realize that if the gas industry is to progress in the right direction scientific and equitable rates are imperative.

## VI. Basic Factors in Determining Rates

There are certain fundamental factors that must be taken into consideration in the determination of a just and equitable form of rate. These basic factors are quite generally recognized by the managers of gas companies and form the basis of all scientific rate structures. While the principles themselves are clearly stated and self evident the application of them in a particular situation is very difficult due to the conservative point of view of the average gas company executive.

### 1. Manufacturing Expenses Vary With the Quantity Sold

The first fundamental and basic factor is that the cost of the manufacture of gas varies with the quantity sold. With an increase in consumption the cost per thousand cubic feet of gas sold is reduced and with a decrease in consumption the cost per thousand cubic feet of gas sold is increased. From the point of view of the cost accountant manufacturing expenses vary with the quantity of gas manufactured or consumed.

In the gas industry the basis of all rates is 1,000 cubic feet. There is no particular reason why rates and computations should be based on this unit figure and in fact some of the more progressive gas companies are now stating their rates on the basis of 100 cubic feet. This smaller base makes it possible to state unit costs and rates in terms that are more easily understood by the average consumer. If rates are stated on the basis of 100 cubic feet the unit costs of service can be figured on the basis of so many cents per 100 cubic feet instead of on the basis of a dollar and a fraction per 1,000 cubic feet. In this way the costs of service can be compared with those of otherpublic utilities ' who have established units that reflect unit costs on the basis of so many cents per unit. With the use of a smaller base for the determination of unit costs the variations in the various elements of cost can be more closely scrutinized.

In the actual process of the manufacture of gas the chemists and gas engineers have devoted great care and thought until today there is little opportunity for improvement in manufacturing methods. Costs as applied to manufacturing expenses have been carefully

'L. R. Dutton in "Gas Service Costs ina Rate Structure (Revised)" American Gas Association Monthly Volume III page 588.
"The writer is convinced that the gas industry has been handicapped in rate matters because of the use of units of 1,000 cubic feet in costs of a dollar or more."

In the gas industry the basis of all rates is 1,000 cubic feet. There is no particular reason why rates and computations should be based on this unit figure and in fact some of the more progressive gas companies are now stating their rates on the basis of 100 cubic feet. This smaller base makes it possible to state unit costs and prices in terms that are more easily understood by the average consumer. If rates are stated on the basis of 100 cubic feet the unit costs of service can be figured on the basis of so many cents per 100 cubic feet instead of on the basis of a dollar and a fraction per 1,000 cubic feet. In this way the costs of service can be compared with those of other public utilities[1] who have established units that reflect unit costs on the basis of so many cents per unit. With the use of a smaller base for the determination of unit costs the variations in the various elements of cost can be more clearly emphasized.

In the actual process of the manufacture of gas the chemists and gas engineers have devoted great care and thought until today there is little opportunity for improvement in manufacturing methods. Costs as applied to manufacturing expenses have been carefully

[1] L. R. Dutton in "Gas Service Units and Rate Structure (Revised)" American Gas Association Monthly Volume 11 page 586.
"The writer is convinced that the gas industry has been handicapped in rate making because of the use of units of 1,000 cubic feet in terms of a dollar or more."

and painstakingly studied and analyzed until today they are at the lowest practical point consistent with the proper manufacture of the product. In all of the gas plants throughout the country every effort is made to keep the manufacturing expenses at a minimum. This is one of the many reasons why when the costs of other commodities during the war were increasing the rates for gas service were increased very little in comparison with the increases in the costs of other commodities.

Due to this careful study of the cost of manufacturing gas the only way in which the average company can reduce its cost of manufacture is to increase the consumption of gas of its present consumers. This same condition is true in the modern manufacturing plant which reduces its costs of manufacturing by increasing its production. The trading corporation, also increases its profits by increasing its sales and reducing the cost of goods sold per unit.

The gas company can reduce its costs by increasing the consumption of its present consumers rather than by the expansion of its system due to the fact that with the extension of its mains and services there is an increase in distribution expenses and plant investment which increases the unit costs. The ultimate goal of all scientific rate structures is to induce

the present consumers to increase their individual consumption and thus reduce the cost of manufacturing and the unit rate to all consumers.

2. Expenses that Vary with the Number of Consumers

The second fundamental and basic factor is that certain types of expenses are determined by the number of consumers which a gas company serves. These expenses are fixed in a certain sense and do not vary from month to month unless the company is in a state of expansion and is consequently increasing its number of consumers monthly. These expenses have to do with the cost of distributing the gas to the consumer at his residence or place of business and the cost of being ready to supply the consumer with gas in any quantity or at any time that he may demand service.

These expenses do not vary with the quantity of gas consumed in any month by all of the consumers or by any individual consumer but vary with the actual number of consumers.

The Service Charge form of rate attempts to determine these costs as a separate unit and to allocate them in a fixed amount per month to each consumer in addition to the rate for the consumption of gas. The actual method of determining these expenses and the amount of the service charge will be explained in the discussion to follow.

3. The Consumer Controls the Amount of Gas Used.

The third fundamental and basic factor is that the amount of gas used, the time the gas is used, and the demand placed upon the company by the individual consumer is controlled by each consumer and not by the company. Due to this factor the company must be ready at all times to supply its consumers with any quantity of gas desired. The company must provide generating equipment, gas holders, mains, services, and meters to provide for any demand that the consumer may require. In addition to this demand provision must be made for reserve capacity for emergencies and unusual demands.

Gas manufacturing is a continuous process the generating house operating on a twenty four hour basis. Gas can not like some commodities be manufactured during the dull periods of the year and stored ready for use in the busy periods. The gas must be manufactured as it is required and consequently the company must provide equipment adequate to meet the greatest demand of all its consumers. Fluctuations in demand are taken care of by the use of the gas holder the gas being manufactured during the day and stored in the holders ready for use as required.

4. The Amount of Gas Used Varies with the Consumers.

The fourth fundamental and basic factor is that the consumption of gas varies with each individual consumer. Some of the consumers require a large amount of gas continuously throughout the year while others use gas in small quantities at different times. Under a flat rate or service charge rate no attempt is made to charge for these demand factors which vary with the consumers.

5. The Expenses of the Company are the Same for the Large or Small Consumer

The fifth fundamental and basic factor is that certain types of expenses of the company are the same for the large consumer as the small consumer. These expenses do not vary with the consumption of the individual consumer but with the number of consumers. They are the ready to serve and consumer expenses. It costs just as much to read the meter, render the bill, and keep the account of the large consumer as the small consumer. Certain general service expenses of the company are also the same for both classes of consumers.

6. Expense is Incurred Whether Service is Used or Not

The sixth fundamental and basic factor is that the consumer by requesting the company to set a meter on his premises incurs expense whether he uses any gas or not. These expenses are incurred at the time the meter is set and are those expenses that have to do with

the demand factors and consumer charges. The meter has to be read, the account entered on the books, and the distribution system be kept in repair and ready to serve in order to keep the gas service available for use. In the case of the emergency consumer these expenses go on although no gas is used. This is true also of the well-to-do consumers who close their homes and apartments during several months of the year while they are away on vacations. Under a flat rate system the burden of this type of expense is placed on the other consumers who are using gas steadily throughout the year and by a peculiar fact this type of consumer is the working men and the industries that use gas steadily for heating and lighting. The service charge rate distributes this type of expense equally and impartially among all the consumers in a fixed amount.

7. Elements of Distribution Expense Vary with the Number of Consumers

The seventh fundamental and basic factor is that certain elements of the cost of distributing gas to the consumers varies with the number of consumers and not with the consumption of gas. The cost of manufacturing gas varies directly with the quantity manufactured while the cost of distributing the manufactured product to the consumer varies with the number of consumers. It costs more to distribute gas to one hundred different consumers at widely different locations from the plant than to distribute the same quantity of gas to a single consumer.

## Part Two

### Discussion

In Part Two the writer has attempted to show how flat meter rates are determined and the method for the determination of the scientific rate. This determination involves a cost analysis of the accounts of the company and the allocation of these accounts to the four basic cost elements. The technical terms are defined and the accounts of the company are discussed in detail giving the items charged and the reason underlying the allocation recommended. The principles of allocation established are then applied to an assumed set of facts in the tabulations submitted and the scientific rate determined. This rate is then applied to a set of consumers by steps of consumption. A final tabulation is submitted giving a comparison of the results of the application of the scientific rate and several standard alternative rates to a set of consumers by steps of consumption.

The analysis of the various classes of consumers is next discussed and the fact proven that under present flat rates a large percentage of the consumers are unprofitable.

The application of the Service Charge rate and its effect on the consumers is next discussed. In accordance with the latest developments in the industry the recommendation is made that the cost analysis for the scientific rate be made although the rate actuallyused may not strictly follow this analysis.

The preliminary statement of what the Service Charge really is, the objections to the Service Charge, and the reactions of the public to this form of rate are then briefly discussed.

Part Two

Discussion

## Discussion

The manufacturing and trading corporations determine their profits from operations on the results of their cost statements. Particularly in the manufacturing industries has the value and the necessity of cost records been demonstrated. With the development of modern business methods it is imperative that accurate and technical statements be prepared showing the costs of the operations of the concern. From the first determination of costs of manufacture and trading the need of knowing what it costs to conduct the general operations of the business has naturally followed. This phase of cost accounting has evolved theories on the cost of service and the value of service. These theories have been applied to types of business which in the ordinary course of events would know nothing of what it costs to furnish the service that they are rendering to their customers. The results of the application of these theories to financial and public service corporations has led to many radical changes in the policies of the management of these corporations.

### I. How are Gas Rates Determined?

A public service corporation does not make by its system of ratesa profit in the same sense as the term is used in regard to manufacturing and trading corporations. The ratesare used to raise a revenue which will be sufficient to pay operating expenses,

provide reserves for depreciation, and earn a fair return on the value of capital invested in plant and equipment.' This revenue should be sufficient to meet these provisions and the company itself is not particularly interested in the method by which the revenue is raised. In order for the company to render service it must earn a revenue which will be adequate for it to meet its current obligations and provide funds to take care of future requirements.

In view of the fact that a gas company is a public service corporation and that its chief function is to render a necessary service to the community which it serves the modern gas company should endeavor to distribute the burden of its expenses as equitably as possible among the various classes of its consumers.

'American Gas Association - Rate Structure Report of 1923 Committee - Appendix A - Cost of Service and Rates Based on Same - Ewald Haase - Page 10
"The income that a utility is reasonably entitled to under the system of State regulation must be sufficient to cover the costs of producing its commodity and of selling and rendering its service, including the cost of maintenance of its property in first class operating condition, the taxes that it is obliged to pay upon its property and income, a fair amount to cover the ultimate retirement of that portion of the property which wears out or becomes obsolete, and besides a fair return upon the fair value of the property as a whole devoted to the public use."

The best way that this can be accomplished is by scientific and equitable rates. These rates endeavor by the use of accurate cost analyses to distribute the burden of furnishing service in such a manner that each individual consumer will pay his just share and no consumer or class of consumers will pay more in order to compensate the loss from those consumers, who under a system of rates not properly determined, are paying less than their share of the expenses of conducting the public utility. Equitable rates in the final analysis should result in the gradual reduction of the commodity rates for all consumers by increasing the consumption of gas and thus reducing the unit costs of manufacture and distribution.

1. Estimated Expenses

The gas company has the problem of what is the best method by which to raise the given revenue. It knows in a general way what its expenses for a given period will be due to past experience. Except for fluctuations in the costs of raw materials and labor these expenses remain fairly constant for a given number of consumers. These expenses in general cover operating, depreciation, taxes, and adequate return. The manufacturing expenses are subject to more variation that those of the distribution department but an estimate can be made which will cover this class

of expenses. With the prepared estimate for the year the next step is to determine in what manner the consumers will be charged for their use of gas service.

2. Estimated Consumption

On the basis of past experience the consumption for the period under consideration can be estimated. With these two estimates it is possible to obtain in a simple way the rate for gas service to each consumer. The simplest method to determine a rate is to divide the estimated consumption by the estimated expenses. The result obtained is the flat rate that can be charged to each consumer on the basis of consumption in order to raise the desired revenue to defray the expenses.

This is the method still used by a great many gas companies to determine the rate to charge for gas. Under this method no attempt is made to analyize the expenses or to allocate them on a scientific basis. There is no question that a flat rate is inequitable and not conducive to the growth of the business, and therefore not conducive to the reduction of costs.

II. Method of Determining Scientific Rates

With the development of cost accounting and the keen competition of modern industries for lighting and heating business gas companies have realized the importance of determining their costs of rendering

service and allocating these costs equitably among their consumers. Several theories of allocation have been evolved but the one which has received the endorsement of the Rate Structure Committee of the American Gas Association is now considered to be the most scientific method of allocating costs among the consumers of a gas company.

This theory is based on the cost of service element in a rate structure. These costs have been determined as falling into three general classes which are proportionate to:

1. Demand
    a. Manufacturing
    b. Distribution
2. Consumers
3. Commodity

In the discussion to follow these terms are defined, the costs allocated, and the method of determining a scientific rate illustrated.

1. The Cost Analysis

The first step in the determination of a scientific rate is to make a cost analysis of the expenses of conducting the company in order to determine unit costs.

a. The Cost of Service Basis'

In the analysis of the operations of a gas company many factors must be taken into consideration in the determination of the cost of furnishing the service to the consumer. There are some unusual conditions in the gas industry that are not present in the ordinary manufacturing and trading concerns. These conditions have to do with the method of distribution of the product direct to the consumer at any time during the day or night and in any quantity that he may need for his requirements. This method of distribution of the product creates many expenses that are difficult to allocate equitably to the individual consumer or to classes of consumers.

1. Consumer Costs

When the consumers make application for gas they request that the company shall furnish them with state tested meters for their exclusive use; that outside service mains shall be provided for their requirements;

' The basis of the discussion on the allocation of costs is built around Appendix A of the Report of the 1923 Committee on Rate Structure of the American Gas Association. This Appendix was prepared by Ewald Haase, Milwaukee, Wisconsin, and is a revision of a paper by the same author published as Appendix A in the 1922 Rate Structure Committee Report. This present revision is the result of the careful discussion of the committee, which is composed of the leading experts on rate structure in the United States.

and that certain expenses shall be incurred for handling their accounts on the books of the company. These expenses have nothing to do with the quanity of gas that the consumers may use and are, therefore, clearly proportionate to the number of consumers.

2. Demand Factor

The use of gas by the consumers creates several cost factors that are not all proportionate to the quantity of gas used during a month or a year. These factors are proportionate to the quantity of gas demanded over a short interval as an hour or a day. Different consumersmay use the same quantity of gas, one class of consumers using this amount during the entire day while the other class of consumers use this amount one hour a day during the time when the heaviest demand is made upon the distribution system. Both of these classes of consumers require for their needs distribution capacity of the same size and value but their requirements in the manufacturing capacity of the plant are entirely different. These two classes of consumers may during the year use the same total quantity of gas and make the same demands during the hourly peak of the day but one class of consumers will have a demand based on the twenty-four hours five or six times as great as the other class of consumers.

Demand elements in a cost analysis are of two kinds; the demand on the manufacturing plant and the demand on the distribution system.

Gas manufacturing is a continuous process, the plant being operated on a twenty-four hour basis. The surplus gas made is stored in the holders ready for use during the peak hours of the day. A manufacturing plant is rated on atwenty-four hour basis and holder capacity is usually provided to take care of three days requirements in accordance with modern operating policies. The demand of a class of consumers made on the manufacturing plant will be that capacity which they require to produce their maximum twenty-four hour quantity of gas subject to diversity factor.

The distribution system must be adequate to meet the instantaneous demand of the consumers so that the distribution demand factor of a consumer will be that capacity which is required to deliver his momentary maximum demand subject to diversity of use among consumers.

3. Diversity Factor

Diversity of demand is a factor very difficult of determination although its existence in certain uses of gas is recognized and must be taken into consideration in the determination of a scientific rate structure.

It is not difficult to realize that the demand of a consumer will not coincide in point of time with the demands of other consumers. There exists a wide diversity as tothe hour and as to the day of the occurence of the maximum demands of the consumers.

There is diversity of use among the consumers, first, as to the moment or hour in which their demand is made, then as to the particular twenty-four hour period in which the demand is made, and also as to the season in which the demand is made. These factors must be correctly determined if the effect of these conditions of the use of gas shall be correctly reflected in the cost factors.

4. Definition and Discussion of Terms Used

In an analysis of the cost of service principle of rate structure there are three elements of cost to be taken into consideration, namely:

1. Consumer Costs
2. Demand Costs
3. Commodity Costs

In a scientific allocation of costs the second element of "Demand Costs" is further divided into:

a. Manufacturing Demand Costs
b. Distribution Demand Costs

a. Consumer Costs

In a study of the expenses of a gas company it is easily recognized that there are many expenses that are alike for each consumer. and are therefore proportionate to the number of consumers. The size of the distribution system is determined by the number of consumers. Consumers require that outside services be laid and meters set without placing them under any obligation to use a certain quantity of gas. There are many general expenses such as bookkeeping, collecting, meter reading, and maintenance of meters and services that vary with the number of consumers and are not dependent upon the quantity of gas used.

Consumer Costs' may be defined as those costs which are proportionate to and vary with the number of consumers.

In the allocation of expenses to follow the test applied to classify an item under "Consumer Costs" is that the item must be of such a nature that it is controlled by the number of consumers or that the consumers should equitably share alike in carrying the expense.

'W. G. Vincent, Jr. "Analyzing Gas Costs and Sales- Proceedings Pacific Coast Gas Association, 1916, Page 267.

" Consumer costs include all costs that are directly affected only by a change in the number of consumers and a portion of those costs that are affected by such a change, but also affected by a change in either the maximum demand or output, or both."

b. Manufacturing Demand Costs

The size of the generating plant and the holder capacity is determined by the maximum composite demand of all of the consumers. The plant and holders must be of sufficient size to supply the requirements of all of the consumers which vary hourly, daily, and seasonally. Gas as manufactured is stored in the holders and manufacturing goes on, as nearly as may be, uniformly throughout the twenty-four hours, and so it may be said that manufacturing capacity together with holder storage must be ample to meet the maximum twenty-four hour use. The function of the plant and holders is to meet the demands that the consumers make upon them so that it is obvious that the costs of providing and maintaining them are related to the demands made by the consumers and not to the quantity of gas used in a month or a year. These expenses include interest, depreciation, taxes, and part of the operating and maintenance expense of the physical property.

Manufacturing Demand Costs' may be defined as those costs which are proportionate to and vary with the requirements of all of the consumers upon the manufacturing plant and holders.

'Principles of Rate Making for Gas Companies, 1926 Rate Structure Committee Report of the American Gas Association Page 21, "All expenses that depend upon or vary with the size or capacity of the production plant should be allocated to production demand."

In the allocation of expenses to follow the test applied to classify an item under "Manufacturing Demand Costs" is that the item must be of such a nature that it is controlled by , or incurred in proportion to demand on the manufacturing plant.

c. Distribution Demand Costs

The size of the distribution system is determined by the amount of gas that the combined demand of all of the consumers may momentarily require. The distribution system must be ample to carry at sufficient pressure the amount of gas necessary to supply each consumer's needs. The distribution of gas direct to the consumer at any time of the day or night and in any quantity is oneofthe functions of the gas company. The expenses of operating and maintaining this system are in proportion to the consumers' demand for gas and are not dependent upon the quantity used in any given period.

The function of the distribution system is to supply the consumers with the volume of gas required at the time of the consumers' demand and at the place required. The place required may be near the holders or at a great distance from them. The volume of gas will vary for each consumer and according to the consumer's use. It is obvious that the costs of providing and maintaining the distribution system are related to the demands made by the consumers and

not to the quantity of gas used in an hour, day, week, month or year. These expenses include interest, depreciation, insurance, and operating and maintenance expenses of the distribution system.

Distribution Demand Costs' may be defined as those costs which are proportionate to and vary with the requirements of all of the consumers upon the distribution system.

In the allocation of expenses to follow the test applied to classify an item under "Distribution Demand Costs" is that the item must be of such a nature that it is controlled by, or incurred in proportion to demand on the distribution system.

d. Commodity Costs

The commodity costs of a gas company are similar to those of the usual manufacturing corporation and include direct material, direct labor, and factory overhead. The difficulty in an analysis of the commodity costs of a gas company is to determine those costs that vary directly with the volume of gas produced.

Commodity Costs''may be defined as those costs that depend upon and vary with the quantity of gas manufactured.

'Principles of Rate Making for Gas Companies, 1926 Rate Structure Committee Report of the American Gas Sassociation, Page 21 "All expenses that depend upon or vary with the size or capacity of the distribution system should be allocated to distribution demand"

''Idem. Page 21. "All expenses that depend upon or vary with the volume of gas produced should be allocated to commodity.

In the allocation of expenses to follow the test applied to classify an item under "Commodity Costs" is that the item must be of such a nature that it ceases when output ceases, or increases as output increases.

e. Load Factors

In the discussion of demand and diversity factors it was shown that the demands upon the manufacturing plant and distribution system varied hourly, daily, and seasonally. This variation in demand of the consumers creates a set of factors that, in the gas industry, are called load factors.

A load factor may be defined as the ratio of the actual average demand for gas to the maximum demand.'

Load factor must be referred to two time elements:

1. The whole period of time under consideration.
2. An interval of time during which the maximum use of the facility occurs.

In order to clarify the discussion on load factors it may be advisable to define certain terms in regard to demand factors in different words from those used in the previous sections.

1. Manufacturing Demand: Manufacturing Demand is the maximum production which the manufacturing plant is called upon to deliver in a twenty-four hour period. It is measured in such a manner because

'Principles of Rate Making for Gas Companies, 1926 Rate Structure Committee Report of the American Gas Association. Page 31. "Load factor as referred to in the gas business, is the ratio of the actual average demand for gas to the maximum demand."

the plant generates at a more or less uniform rate throughout twenty-four hours.

2. Distribution Demand: Distribution Demand is the maximum actual momentary delivery. It is usually measured by the maximum ten or fifteen minute output and stated in terms of cubic feet delivered during one hour at such ten or fifteen minute rate.

3. Consumer's Demand: Consumer's Manufacturing Demand is his maximum use during twenty-four hours, and his Distribution Demand is the maximum use for ten or fifteen minutes stated in terms of cubic feet per hour at such ten or fifteen minute rate, both subject to diversity.

4. Diversity Factor: Diversity Factor is the ratio of the sum of consumers maximum demands to total actual demand at the plant.

This diversity factor is applicable to all observed consumers' demands. Not all consumers use their maximum demand at the same time or in the same unit period. The sum of all the maximum demands of consumers is greatly in excess of the actual demand of the plant due to diversity of use on the part of individual consumers. The demand on manufacturing capacity in the twenty-four hour cycle is subject to less diversity, the total varying less between consumers and classes of consumers, than the demand on distribution capacity.

The following load factors are generally used:

1. Production Plant Load Factor.

The production plant load factor is the ratio of the total annual send-out to the maximum daily send-out multiplied by the number of days in the year.

2. Distribution System Load Factor

The distribution system load factor is the ratio of the total annual send-out to the maximum hourly send-out multiplied by the number of hours in the year.

3. Consumer's Daily Load Factor

The daily load factor of a consumer is the ratio of his total annual consumption to his maximum daily demand multiplied by the number of days in the year.

To illustrate the determination of these three load factors the following examples are given:

1. Production Plant Load Factor

A manufacturing plant having a daily maximum capacity of 30,000,000 cubic feet with annual sales of 10,000,000,000 cubic feet would have a plant load factor of 91%

$$\frac{10,000 \text{ million}}{30,000 \text{ million} \times 365} :: 91\%$$

2. Distribution System Load Factor

A distribution plant of 5,000,000 cubic feet maximum hourly output and with annual sales of 10,000,000,000 cubic feet would have av annual load factor of 22%.

$$\frac{10,000 \text{ million}}{5 \text{ million} \times 8,760} :: 22\%$$

3. Consumer's Daily Load Factor

The consumer's daily load factor is divided into two parts, the load factor of the manufacturing plant and the load factor on the distribution system.

a. Manufacturing

A consumer having a twenty-four hour demand of 10,000 cubic feet and an annual consumption of 900,000 cubic feet has an annual load factor of manufacturing capacity demanded of 24%.

$$\frac{900,000}{10,000 \times 365} :: 24\%$$

b. Distribution

His distirbution annual load factor on an hourly demand of 500 cubic feet would be 20%

$$\frac{900,000}{500 \times 8,760} :: 20\%$$

B. Allocation of Costs

In the gas industry at the present time there are two principal kinds of gas being manufactured, coal gas and carburetted blue gas. Most of the larger companies manufacture both kinds and mix them before distribution to the consumers. Coal gas is manufactured by the carbonization of coal in retorts giving the two products, coke and coal gas. The coke is then used as fuel for the manufacture of carburetted blue gas, which is made by passing steam through the coke at high temperatures and then enriching the resulting blue gas with oil gas.

In the analysis and allocation of operating costs to follow the accounts for both types of gas are treated using the Uniform Classification of Accounts for Gas Companies.

1. Allocation of Operating Expenses

a. Manufacturing

In the manufacture of gas the expenses can be allocated under two of the basic costs, namely Manufacturing Demand and Commodity. The manufacturing expense depends upon the size of the maximum demand and the quantity of gas sent out. All expenses normally included under manufacturing will, therefore, be divided between Manufacturing Demand and Commodity with the exception of the operation and maintenance of commercial holders which will be allocated to Distribution Demand.

701.1 Works Superintendence

This account includes the salaries of superintendents, assistants, chemists, day and night foremen, and station clerks. This is clearly a Manufacturing Demand item. It is fixed by the size and character of the plant, the whole of which is operated in conformity with Demand. It should be allocated a 100 per cent to Manufacturing Demand.

701.2 Boiler Labor

See Steam Account 712

701.3 Retort Labor

701.4 Generator Labor

The cost of labor employed in the operation of the coal gas retorts, generators, and accessories, and the handling of fuels used in the retorts and generators is charged to this account.

There will probably be a fixed portion of retort house and generator labor that goes on regardless of whether output decreases or increases. Certain expenses are not altogether proportional to output as they do not cease with a decrease in output but remain more or less constant with the capacity of the plant. A crew of plant operatives can not be discharged when output must be cut down with reduced demands. The maintenance of apparatus goes on just the same though output is curtailed.

The cost of labor which would be required to keep the retorts and generators under fire should be allocated to Manufacturing Demand; all other labor should be allocated to Commodity.

This allocation may be based upon the manufacturing load factor of the plant although other factors may have to be taken into consideration.

701.5 Purification Labor

This account includes the cost of labor such as foremen and laborers employed in emptying, cleaning, and filling purifier boxes, and such other labor employed in the handling of purifying materials. This

expense is directly proportionate to the quantity of gas manufactured and is, therefore, allocated a 100 per cent to Commodity.

701.6 Miscellaneous Works Labor

The cost of general labor not specifically engaged in the process of making gas is charged to this account. All of this expense is of such a nature that any change in the manufacturing operating schedule would not affect it. This expense continues whether any gas is manufactured or not. A 100 per cent allocation to Manufacturing Demand is recommended although in particular plants it might be allocated 50 per cent to Manufacturing Demand and 50 per cent to Commodity.

702.1 Boiler Fuel

See Steam Account 712

702.2 Water

See Steam Account 712

703. Fuel Under Retorts

The cost of fuel used under retorts is charged to this account. The proportion of fuel used in bringing the benches up to heat and holding them at this heat until charged should be allocated to Manufacturing Demand, the remainder of the cost of fuels used in the process of making gas should be allocated to Commodity. The amount to be allocated to Manufacturing Demand should be based on tests made for this purpose.

704. Coal Carbonized

This account is charged with the cost of gas coal used in the retorts. This expense ceases when output ceases. A 100 per cent allocation to Commodity should therefore be made.

705. Generator Fuel

The cost of fuels used in the generators should be charged to this account. That proportion of generator fuel which is used when gas is not actually being made should be charged to Manufacturing Demand, the remainder of the cost of fuel used in the process of making gas should be allocated to Commodity. The amount to be allocated to Manufacturing Demand should be based on tests made for this purpose.

706. Water Gas Enricher

This account includes the cost of gas oil and naphtha used in making water gas. The expense is entirely proportional to the quantity of gas manufactured. A 100 per cent allocation to Commodity should therefore be made.

707.1 Coal Gas Enricher

This account includes the cost of enricher materials which is proportional to the quantity of gas manufactured. A 100 per cent allocation to Commodity should therefore be made.

707.2 Purification Supplies

This account includes the cost of materials used in gas purification. This expense ceases when output ceases. A 100 per cent allocation to Commodity should therefore be made.

707.3 Miscellaneous Works Expense

This account consists of the cost of sundry supplies and expenses incurred in connection with the works and not properly chargeable to any of the other accounts. Part of this expense would continue if manufacturing was curtailed or suspended. A 50 per cent allocation to Manufacturing Demand and 50 per cent allocation to Commodity is recommended. Based upon actual conditions in a given plant different percentages might be used to obtain more accurate allocations.

707.4 Gas Storage

This account includes the cost of labor and materials, except maintenance, employed in storing and regulating the supply of gas to the distribution mains.

Holders are provided for storage because of the variation in hourly demand within a twenty-four hour period. A 100 per cent allocation to Distribution Demand should therefore be made.

708 Maintenance of Works and Station Structures

Maintenance expenses, here included, are caused by the wear and tear on the buildings and

structures and are necessary for the current upkeep of the property. These expenses are governed by the extent and character of the plant rather than by the output. A 100 per cent allocation to Manufacturing Demand should therefore be made.

709.12 Maintenance of Furnaces and Boilers

See Steam Account 712

709.13 Maintenance of Boiler Apparatus

See Steam Account 712

709.14 Maintenance of Steam Accessories

See Steam Account 712

709.15 Maintenance of Steam Engines

709.16 Maintenance of Internal Combustion Engines

709.17 Maintenance of Miscellaneous Power Equipment

709.21 Maintenance of Purification Apparatus

709.25 Maintenance of AccessoryWorks Equipment

709.26 Maintenance of Laboratory Equipment

709.27 Maintenance of Implements and Accessories

The cost of repairs caused by wear and tear on equipment during manufacturing which are due to use should be allocated to Commodity.

During a period of curtailment certain maintenance expenses are incurred in keeping the equipment in condition so that when this equipment is again called into operation it can be used to capacity. These expenses are incurred in being ready to serve and are not proportionate to output. These expenses

when properly determined by conditions should be allocated to Manufacturing Demand.

709.24 Maintenance of Commercial Holders

This account is charged with the cost of repairs of gas holders at the works and of those at distribution stations.

Holders are provided for storage because of the variation in hourly demand within a twenty-four hour period. A 100 per cent allocation to Distribution Demand should therefore be made.

710. Gas from Other Sources

The allocation of this cost between Manufacturing Demand and Commodity should be based on the provisions of the contract under which the gas is purchased.

If a company has sufficient manufacturing capacity to meet its full demand, and gas is purchased at a price lower than that at which it can be manufactured, then the cost of the gas purchased should be allocated to Commodity.

The expense of pumping this gas should be allocated on the same basis as the expense of pumping the plant's own manufactured gas.

711. Power from Other Sources

The cost of power from other sources should be allocated on the same basis as suggested for Gas from Other Sources, according to contract and actual conditions at the plant between Manufacturing Demand and Commodity.

712. Steam

The steam apportionment account includes the following other accounts:

701.2 Boiler Labor

702.1 Boiler Fuel

702.2 Water

709.12 Maintenance of Furnaces and Boilers

709.13 Maintenance of Boiler Apparatus

709.14 Maintenance of Steam Accessories

The amount to be apportioned should be determined by the use of steam meter or on the basis of tests, whereby the quantity of steam used in the various operations can be ascertained.

The quantity of steam used in the actual manufacture of gas should be allocated to Commodity.

The quantity of steam used for station use and stand by service should be apportioned between Manufacturing Demand and Distribution Demand. The quantity of the steam used in heating the holders should be assigned to Manufacturing Demand.

The cost of steam used in transmission pumping, which varies with the quantity of gas pumped, should be allocated to Commodity.

713. Residuals Produced - Credit Residual Expense

The net credit is proportionate to the quantity of gas manufactured. This credit is therefore allocated a 100 per cent to Commodity

714. Residual Expense

715. Duplicate Manufacturing Charges - Credit

Allocated a 100 per cent to Commodity

716. Manufacturing Expenses Transferred - Credit

This account is credited with an amount representing an equitable proportion of operating expenses incurred in manufacturing gas or steam for use in another department. Only credits representing expenses directly related to the manufacturing of gas or steam may be included.

This account may also be credited with all charges made to manufacturing accounts for gas consumed at the works and not otherwise provided for.

It should be allocated a 100 per cent to Commodity.

b. Transmission and Distribution Expenses

721.1 Transmission Pumping

This account includes the cost of pumping gas through the mains to the distribution system. The cost of the steam used in transmission pumping is taken care of in the steam apportionment account. An analysis of the other items, such as labor, fuels, miscellaneous supplies, and purchased power used in connection with pumping gas, which are charged to this account, would be desirable.

The allocation of these expenses will depend upon the types of gas distribution systems and local load conditions. In such cases where all of the gas is pumped from the works to the outlying

holders, the pumping charge should be allocated to Commodity. In systems where boosters or high pressure compressors are used during peak hours the charge should be allocated to Distribution Demand. In systems where all of the gas is delivered under high pressure, such part of the charge as is required to maintain a minimum pressure should be allocated to Commodity and the remainder to Distribution Demand.

It will simplify the process of allocating, however, if all labor and miscellaneous expense is assigned to Distribution Demand and all fuels and power to Commodity. This will result in an equitable allocation.

721.21 Distribution Superintendence

This account includes the cost of all labor employed in superintending the operation of the street department, and fitting and repair shops.

This expense should be allocated to Distribution Demand and Consumer in accordance with the investment in the distribution system, as shown in the fixed capital allocation.

721.22 Distribution Supplies and Expenses

The cost of office maintenance and incidental expenses of the street and shop departments, such as light, heat, telephone, water, ice, etc., stationery, and other office supplies are charged to this account.

This expense, it is recommended, should be allocated to Distribution Demand and Consumer in accordance with the investment in the distribution system as shown by the fixed capital allocation.

721.3 Consumers Premises Work

This account includes the cost of labor and materials used in disconnecting and reconnecting services on the consumers premises.

This work is caused by the consumer and should be allocated a 100 per cent to Consumer.

721.4 Removing and Resetting Meters

This account includes the cost of labor and other expense incident to removing and resetting meters on the consumers' premises.

This work is caused by the consumers and should, therefore, be allocated a 100 per cent to Consumer.

722.1 Maintenance of Mains

This account includes the cost of repairing, overhauling and changing the position of transmission and distribution mains, including such items as seeking and repairing leaks, repairing pipes or removing and replacing worn sections and fittings, caulking, digging, and repaving in connection with such work, repairing transmission pumps and regulators on transmission lines, manholes, valves, and other transmission equipment.

This account should be allocated in the same proportion as the respective physical property distribution.

722.2 Maintenance of Servies

This account includes the cost of labor, material, and supplies and other expense incident to repairing gas services, including such items as seeking and repairing leaks, removing and replacing worn out pipes and fittings, stop cocks, service boxes, thawing services, cleaning and blowing out service pipes, digging and repaving in connection with repair work, replacing house governors and maintenance of same.

This work is caused by the consumer and should, therefore, be allocated a 100 per cent to Consumer.

722.31 Maintenance of Shop Buildings

This account includes the cost of repairing and maintaining buildings, fixtures, and grounds devoted to transmission and distribution purposes.

This account should be allocated in the same proportion as the respective physical property distribution.

722.32 Maintenance of Distribution Implements and Accessories

This account includes the cost of sharpening and repairing such tools and implements as have been assigned to the street department and the fitting and repair shops and not included in any of the foregoing accounts.

This account should be allocated in the same proportion as the respective physical property distribution.

722.33 Maintenance of Gas Appliances

This account includes all expenditures made in connection with maintaining the efficiency of consumers' installations on their premises for which no charge is made to the consumers. This includes expenses incurred in investigating complaints, inspecting and testing new piping and fixtures, inspecting, cleaning, and repairing gas appliances belonging to the consumer, changing location of piping and appliances in houses and reconnecting same, and similar items of expense.

This work is caused by the consumer and should, therefore, be allocated a 100 per cent to Consumer.

723. Maintenance of Consumers' Meters

This account includes the cost of maintaining consumers' meters. This includes readjusting, maintenance of meter shelves, painting, locks and keys for prepayment meters, replacing meter badges, worn out parts, connections and fittings, and other incidental expenses.

This work is caused by the consumer and should, therefore, be allocated a 100 per cent to Consumer.

724. Duplicate Distribution Charges

These charges should be allocated according to their origin.

731. Operation of Street Lamps

This account includes the cost of labor employed in the operation of street lamps. This includes lighting and extinguishing, inspecting and cleaning lamps and lamp equipment, patrolling and reporting on relights and discontinues, and watching the hours for lighting and extinguishment, relocating lamps, and other miscellaneous street lamp operating labor.

This account should be allocated in the same proportion as the respective physical property distribution.

732. Maintenance of Street Lamps

This account includes the cost of repairing street lamps and equipment, including refitting standpipes, cleaning services, recaulking columns, removing and resetting posts, refitting columns, straightening posts and other work of similar character.

This account should be allocated in the same proportion as the respective physical property distribution.

c. Commercial Expenses

761.1 Commercial General Labor

This account includes the salaries of employees whose time is devoted in whole or in part to the operation of the commercial office.

This expense varies with the number of consumers served and should, therefore, be allocated a 100 per cent to Consumer.

761.21 Commercial Bookkeeping

This account includes the salaries of clerks and bookkeepers employed in the consumers bookkeeping department.

This expense varies with the number of consumers served and should, therefore, be allocated a 100 per cent to Consumer.

761.22 Commercial Contracts

This account includes the salaries of clerks and stenographers employed in the application department.

This expense varies with the number of consumers served and should, therefore, be allocated a 100 per cent to Consumer.

761.31 Commercial Collecting

This account includes the salaries of clerks, collectors, and stenographers employed in the collection department.

This expense varies with the number of consumers served and should, therefore, be allocated a 100 per cent to Consumer.

761.32 Meter Reading

This account includes the salaries of meter readers, indexers, clerks, and stenographers employed in the meter reading department.

This expense varies with the number of consumers and should, therefore, be allocated a 100 per cent to Consumer.

761.4 Commercial Supplies and Expenses

This account includes commercial department supplies and expenses not otherwise provided for. To this account should be charged light, heat, telephone, janitor and watchman service, water, ice, and laundry; commercial department stationary, printing, and postage; repairs to commercial office furniture and equipment, etc.

This expense varies with the number of consumers served and should, therefore, be allocated a 100 per cent to Consumer.

762. Agents' Commission

This account includes all fees and commissions paid for collecting bills.

This expense varies with the number of consumers served and should, therefore, be allocated a 100 per cent to Consumer.

d. New Business Expenses

771.11 New Business Management Salaries

This account includes the salaries and wages of all employees whose services are devoted to the promotion and extension of the gas utility business. It also includes the salaries of employees engaged in preparing estimates or engineering data in connection with proposed consumers' installations.

This expense is incurred for two main purposes; to increase the number of consumers and to increase the sale of gas. That part of the expense that is incurred to increase the number of consumers should be allocated to Consumer and the balance of the expense to Commodity. In particular circumstances an equitable allocation might be 50 per cent to Consumer, 12 1/2 per cent to Manufacturing Demand, 12 1/2 per cent to Distribution Demand, and 25 per cent to Commodity, although the first allocation is the more practical.

771.12 New Business Advertising Salaries

This account includes the salaries of the advertising managers and clerks.

This expense is incurred for two main purposes;to increase the number of consumers amd to increase the sale of gas. That part of the expense that is incurred to increase the number of consumers should be allocated to Consumer and the balance of the expense to Commodity.

771. 21 Demonstrations

This account includes the salaries of demonstrators and expenses incurred in introducing new types of appliances to the consumers.

This expense is incurred for two main purposes; to increase the number of consumers and to increase the sale of gas. That part of the expense that is incurred to increase the number of consumers shou ld be allocated to Consumer and the balance of the expense to Commodity.

771.23 Advertising Supplies and Expenses

This account includes the cost of supplies and expenses incurred in operating the Advertising Department and expenses of conducting advertising campaigns.

This expense is incurred for two main purposes; to increase the number of consumers and to increase the sale of gas. That part of the expense that is incurred to increase the number of consumers should be allocated to Consumer and the balance of the expense to Commodity.

771. 24 Canvassing and Soliciting

This account includes the salaries and wages of canvassers and soliciters employed in introducing new types of appliances to the consumers.

This expense is incurred for two main purposes; to increase the number of consumers and to increase the sale of gas. That part of the expense that

is incurred to increase the number of consumers should be allocated to Consumer and the balance of the expense to Commodity.

771. 25 Miscellaneous New Business Supplies and Expenses

This account includes the cost of office supplies consumed and expenses incurred in conducting the new business department including rent, light, heat, telephone, printing, and stationery, and all other items of a similar character.

This expense is incurred for two main purposes to increase the number of consumers and to increase the sale of gas. That part of the expense that is incurred to increase the number of consumers should be allocated to Consumer and the balance of the expense to Commodity.

e. General and Miscellaneous Expenses

781.11 Administrative Salaries

This account includes the salaries of the chairman of the board, president, vice-presidents, secretary, treasurer, comptroller, general auditor, general manager, assistant general manager, superintendent, purchasing agent, and all other officers whose jurisdiction extends over the entire utility; also fees of directors, and fees to engineering corporations for supervising and managing operations of the company.

This expense is of a mixed nature and applies to all of the functions of the utility and may be equitably allocated 40 per cent to Consumer, 20 per cent to Manufacturing Demand, 20 per cent to Distribution Demand, and 20 per cent to Commodity.

781.12 General Office Salaries

This account includes the salaries of traveling auditors, general bookkeepers, stenographers, and other general office clerks whose services cannot be satisfactorily distributed to specific accounts.

This expense is of a mixed nature and applies to all of the functions of the utility and may be equitably allocated 40 per cent to Consumer, 20 per cent to Manufacturing Demand, 20 per cent to Distribution Demand, and 20 per cent to Commodity.

781.21 General Office Supplies and Expenses

This account includes the cost of office supplies, books, blanks, and other records for use in the general office; also cost of postage, repairs to general office furniture, wages of janitors, porters, and messengers; meals, telegrams, telephone, and other general office expenses.

This expense is of a mixed nature and applies to all of the functions of the utility and may be equitably allocated 40 per cent to Consumer, 20 per cent to Manufacturing Demand, 20 per cent to Distribution Demand, and 20 per cent to Commodity.

781.22 General Stationery and Printing

This account includes the cost of stationery and all printed forms made for special uses in the general office.

This expense is of a mixed nature and applies to all of the functions of the utility and may be equitably allocated 40 per cent to Consumer, 20 per cent to Manufacturing Demand, 20 per cent to Distribution Demand, and 20 per cent to Commodity.

781.23 Maintenance of General Structures

This account includes the cost of all labor and meterials expended in the repairs and maintenance of general office buildings or other structures used for general purposes. This covers maintenance of walks, driveways, and grounds connected therewith, and all incidental expenses connected with the maintenance of such buildings and structures. This account includes such buildings as general office buildings, general shops, general storehouses, general stables, garages, etc.

This expense is of a mixed nature and applies to all of the functions of the utility and may be equitably allocated 40 per cent to Consumer, 20 per cent to Manufacturing Demand, 20 per cent to Distribution Demand, and 20 per cent to Commodity.

781. 26 Law Expenses

This account includes all law expenses, such as the salaries and expenses of general counsel, solicitors, attorneys and their clerks; fees and retainers for attorneys not regular employees; cost of printing briefs, legal forms, legal advertisements, testimony, and reports; court fees, court costs witness fees and expenses of taking depositions: and other miscellaneous legal expenses.

This expense is of a mixed nature and applies to all of the functions of the utility and may be equitably allocated 40 per cent to Consumer, 20 per cent to Manufacturing Demand, 20 per cent to Distribution Demand, and 20 per cent to Commodity.

781.27 Insurance

This account includes the cost of insurance including premiums paid for fire, boiler, fidelity, casualty, burglar, workmen's compensation, public liability, or other forms of insurance.

Insurance expenses should be allocated according to the kind of property on which this insurance is carried, in which the allocation of property will be a guide.

781.28 Stores Expenses

This account includes all salaries and expenses in connection with storerooms, including cost of sending materials and supplies from general

storerooms, and the collection of scrap material.

Stores expenses should be allocated in the proportion that the stores are used. This may well follow the allocation of the stores as made through the expense accounts.

781.29 Transportation Expenses

This account includes the salaries and wages of drivers, chauffeurs, stablemen, garagemen, and other employees in garages and stables, cost of food, keep, and shoeing of horses; veterinary and other stable expenses; fuel, gasolene, and all other materials and supplies for garages and stables.

These expenses should be allocated on the same basis as the operations incurring transportation expense were allocated.

781.30 Undistributed Adjustments

This account includes any items of an adjusting character made during the accounting period.

These items should be allocated according to their nature.

781.31 Rentals

This account includes the cost of rentals paid during the accounting period for offices or plants.

These items should be allocated according to their nature.

781.32 Other Miscellaneous General Expenses

This account includes the cost of publishing and distributing annual reports to stockholders, advertising notices of stockholders' meetings, dividend notices and other corporate and financial notices of a general character, association dues, contributions for conventions and meetings of the industry, cost of experimental work conducted for the benefit of the industry or the improvement of service, traveling and incidental expenses of general officers and other general office employees, fees of transfer agents, registrars of stock and fiscal agents, and other miscellaneous expenses connected with the general management not otherwise provided for.

These expenses are of a mixed nature and apply to all of the functions of the utility and may be equitably allocated 40 per cent to Consumer, 20 per cent to Manufacturing Demand, 20 per cent to Distribution Demand, and 20 per cent to Commodity.

782. Retirement Expense

This account includes the estimated amount necessary to provide for the retirement of property no longer used or useful to the company.

This expense may be prorated according to the allocation of physical property.

783. Injuries and Damages

This account includes all expenses on account of persons killed or injured, and property damaged in connection with the operation of the utility; salaries and expenses of claim agents, investigators, adjusters, and others engaged in the investigation of accidents and adjustments of claims; salaries and fees and expenses of surgeons and doctors, cost of nursing, hospital attendance, medical and surgical supplies; fees and expense of coroners and undertakers; contributions to hospitals; amount paid in settlement of claims of persons for personal injuries sustained in connection with the operation of the utility, and amount paid in settlement of claims for damages to property not owned by the accounting utility.

This account also includes all law expenses in connection with the defence or settlement of damage claims, such as a proper proportion of the salary and expenses of the general solicitor or counsel; salaries, fees, and expense of attorneys engaged in such work; court fees and costs; expenses of taking depositions, witness fees and the cost of printing briefs, court records and similar papers.

This expense is of a mixed nature and applies to all of the functions of the utility and may be equitably allocated 40 per cent to Consumer, 20 per cent to Manufacturing Demand, 20 per cent to Distribution Demand and 20 per cent to Commodity.

787. Injuries and Damages

This account includes all expenses on account of persons killed or injured, and property damage in connection with the operation of the utility: salaries and expenses of claim agents, investigators, adjusters, and clerks engaged in the investigation of accidents and adjustments of claims: salaries and fees and expenses of surgeons and doctors, cost of nursing, hospital attendance, medical and surgical supplies; fees and expense of coroners and undertakers; contributions to hospitals; amount paid in settlement of claims of persons for personal injuries sustained in connection with the operation of the utility, and amount paid in settlement of claims for damages to property not owned by the accounting utility.

This account also includes all law expenses in connection with the defense or settlement of damage claims, such as a proper proportion of the salary and expenses of the general solicitor or counsel; salaries, fees, and expense of attorneys engaged in such work; court fees and costs; expenses of taking depositions, witness fees and the cost of printing briefs, court records and similar papers.

This expense is of a mixed nature and applies to all of the functions of the utility and may be equitably allocated 40 per cent to Consumer, 10 per cent to Manufacturing Demand, 30 per cent to Distribution Demand and 20 per cent to Commodity.

784. Regulatory Expense

This account includes expense incurred in preparing reports and statistical information for the publice utility commission and fees and expenses for filing the required returns and reports.

This expense is of a mixed nature and applies to all of the functions of the utility and may be equitably allocated 40 per cent to Consumer, 20 per cent to Manufacturing Demand, 20 per cent to Distribution Demand, and 20 per cent to Commodity.

785. Relief and Welfare Work

This account includes salaries and expenses incurred in connection with conducting a relief department, and contributions made to such department; also pensions and gratuities paid to retired or incapacitated employees, or heirs of employees, and expense in connection therewith, and cost of life and benefit insurance on employees. This account also includes salaries of employees and expenses incurred in connection with conducting a welfare department, including the expense of publications and contirbutions made to such departments.

This expense is of a mixed nature and applies to all of the functions of the utility and may be equitably allocated 40 per cent to Consumer, 20 per cent to Manufacturing Demand, 20 per cent to Distribution Demand ,and 20 per cent to Commodity.

787. Amortization of Franchises

This account is charged, when used, with the portion of the estimated value of the franchises expiring each accounting period.

This expense is of a mixed nature and applies to all of the functions of the utility and may be equitably allocated 20 per cent to Manufacturing Demand, 40 per cent to Consumer, 20 per cent to Distribution Demand, and 20 per cent to Commodity.

788. Gas Expenses Transferred - Credit

This account includes such part of the operating costs (other than manufacturing expenses) borne in the first instance by the gas department but which are properly chargeable to other departments, such as electric or power departments.

This account is of a mixed nature and applies to all of the functions of the utility and may be equitably allocated 40 per cent to Consumer, 20 per cent to Manufacturing Demand, 20 per cent to Distribution Demand, and 20 per cent to Commodity.

789. Joint Operating Expense - Credit

This account includes such part of the operating expenses as are incurred jointly with the other department of the utility.

This account is of a mixed nature and applies to all of the functions of the utility and may be equitably allocated 40 per cent to Consumer, 20 per cent to Manufacturing Demand, 20 per cent to Distribution

Demand, and 20 per cent to Commodity.

790. Duplicate Miscellaneous Charges - Credit

This account includes such part of the miscellaneous charges as are incurred by all of the departments of the utility.

This account is of a mixed nature and applies to all of the functions of the utility and may be equitably allocated 40 per cent to Consumer, 20 per cent to Manufacturing Demand, 20 per cent to Distribution Demand, and 20 per cent to Commodity.

f. Taxes

404. Taxes

The tax account is subdivided into the following sub accounts:

1. Property and Capitalization Taxes

The allocation of these taxes follow the allocation of Fixed Capital plus Working Capital to the three basic costs.

2. Gross Receipts Tax

This is an expense which cannot logically be allocated to any of the four basic costs but bears a direct relationship to Operating Revenue. This expense must be arbitarily assigned to these costs on a percentage basis or included in total in one of the costs. As the amount of Operating Revenue has a very direct relationship to the amount of gas sold it seems best to allocated the amount of the Gross Receipts Tax directly to Commodity.

3. Income Taxes

The item of Income Taxes falls into the same class as the Gross Receipts Tax and it is recommended that it be entirely allocated to Commodity.

4. Miscellaneous Taxes

A study of the miscellaneous taxes should be made and they should be allocated on the basis of the analysis made.

2. Working Capital

The analysis of the working capital accounts of the company is best made by grouping the various current asset accounts and then applying the same basis of allocation to each item in the group. The accounts fall naturally into the following groups:

Group 1. Coal, Coke, and Oil

The cost of coal, coke, and oil is partly a Manufacturing Demand element and partly a Commodity element depending upon the policies of the company to some extent. The amount of these materials necessary to have on hand in order to keep the plant in readiness to meet its maximum demand represents that portion of this group that should be charged to Manufacturing Demand. In operating practice thirty days supply of this material is considered necessary to keep the plant in operating condition. Any stock carried in excess of this amount should be allocated to Commodity as it is necessary only because gas is being manufactured.

Group 2. Manufacturing Plant Maintenance Parts

This group represents material held in readiness to replace any manufacturing plant part that fails. It is not considered safe to operate the plant without having certain of these parts on hand. This group is in reality a part of the Plant Investment account and should, therefore, be allocated a 100 per cent to Manufacturing Demand.

Group 3. Distribution Department Maintenance Parts

This group is of the same character as Group 2 and should be allocated a 100 per cent to Distribution Demand.

Group 4. Pipe Fittings, Meters, Governors, etc. for extensions for new consumers.

This group represents the investment in materials necessary for future extensions. The group should be subdivided into Distribution Mains, Services, Meters and their connections. Then this should be allocated on the same basis for Distribution Mains as Group 4 and Service, Meters and their connections as Group 5 of the Fixed Capital allocation

Group 5. Gas Appliances The investment in gas appliances should be allocated a 100 per cent to Consumer.

Group 6. General Office Supplies

The investment in general office supplies should be allocated a 100 per cent to Consumer

Group 7. Cash

The cash balance which it is necessary to keep on hand depends upon the extent of the payroll and the frequency of payment to employees, the normal amount of consumer accounts outstanding, etc. Based upon a study of conditions the amount of the cash balance to be maintained can be determined. An analysis of this amount should result in a percentage that can be allocated equtiably to each of the four basic cost elements.

3. Fixed Capital

The accounts representing the fixed capital can be grouped in order to simplify the allocation and discussion.

Group 1. 301 Organiztion
302 Franchises
303 Miscellaneous Intangible Capital

The amounts expended by every company for these intangible assets will depend upon the size of the Fixed Capital. The items in this group should be allocated in the same manner as the tangible Fixed Capital.

Group 2. 311 Land
312 Structures

The amounts in this group should be allocated according to their use. The land and structures devoted to the manufacturing plant should be allocated to Manufacturing Demand, that devoted to distribution to Distribution Demand, and that devoted to the use of the consumer to Consumer.

Group 3. 313 to 320 Production and Auxiliary Equipment

The magnitude of the investment in the manufacturing equipment depends entirely upon the capacity of the plant which is fixed by the maximum manufacturing demand and, therefore, its resulting cost should be allocated a 100 per cent to Manufacturing Demand.

Group 4. 321 Mains

The main account represents two classes of investment; first, the investment in mains to connect two or more manufacturing plants or the investment in mains to transmit gas supplied from an outside point to a distribution center; second, the investment in mains for distributing gas from manufacturing points and distribution centers to the consumers. The cost of the first class is properly allocated a 100 per cent to Manufacturing Demand, as it is essential to the delivery of gas to the distribution system.

The cost of the second class is allocated in two parts as follows: If the distribution demand was constant the distribution main system could be composed entirely of the minimum main size which it is the custom to lay. The mileage of the mains varies in direct proportion to the number of consumers served. It therefore follows that the costs incident to the capital required to provide such a system of minimum

size mains is properly a consumer cost and should, therefore, be allocated a 100 per cent to Consumer. The difference between the total distribution main investment and the cost of the investment as determined above should be allocated to Distribution Demand.

Group 5. 322 Consumers' Services
323 Meters
324 Installation of Meters

The amount of capital invested in services and meters is assigned to the use of the individual consumer so, therefore, the investment should be allocated a 100 per cent to Consumer.

Group 6. 325 Street Lighting Equipment

The amount of capital invested in street lighting equipment falls into the same class as Group 5 and should, therefore, be allocated a 100 per cent to Consumer.

In most public utilities, however, street lighting is considered as a class of business by itself and is not included in the allocation made to the consumers. Contracts are usually made with the municipality so as to just cover the expense of operation and the manufacturing cost of the gas consumed. With modern methods of operation these costs can be accurately determined and a special class rate established.

Group 7. 326 Gas Appliances.

The investment in gas appliances is obviously directly concerned with the number of consumers and

should be allocated a 100 per cent to Consumer.

In most of the larger public utilities the operation of the appliance department is considered as a separate business and not a part of the operating expense of the utility. It is usually classed as a non-operating department and the profit or loss from the business is treated as other income or expense. The inventories of gas appliances are kept as low as possible and the investment is not taken into consideration in the allocation made to the consumers.

Group 8. 327 General Equipment

The general equipment account includes the investment in office equipment, stores equipment, shop equipment, telephone, telegraph, and wireless system, laboratory equipment, and miscellaneous property. The items in this account should be studied with a view of determining the use to which the equipment is put. The investment represented by each when ascertained should be allocated to the corresponding fixed capital group, such as manufacturing plant, distribution system, and general office. All fixed capital of a general nature which cannot readily be allocated to any of the cost elements might be treated as is Group 1; namely, allocated on the basis of all other fixed capital.

Group 9. 328 Miscellaneous Tangible Capital
351 Overhead Costs and Undistributed
to Items Which Include All Tangible
359 Capital Not Elsewhere Provided For
and All Undistributed Structural Costs.

The nature of these accounts is such that it is difficult to allocate them directly to the four basic cost items. The best method, perhaps, of allocating them is on the basis of tangible fixed capital. It might be désirable in some companies to make a detailed study of each account in this group with a view toits direct allocation as far as possible to specific physical property.

4. Rate Base

Before demonstrating the application of the theory of the allocation of costs on the scientific basis explained in the discussion by anassumed set of facts it is desirable to discuss some important principles of valuation and relations of classes of consumers.

The method of valuation of the property of the utility has become from the viewpoint of the Public Utility Commissions, the Courts and the companies the most important and difficult element in the determination of rates. When the value is once determined to the satisfication of the three parties concerned the other problems are considered to be easier of solution . The importance of this element has led rate students to call the valuation of property the rate base.'

'Principles of Rate Making for Gas Companies, 1926 Rate Structure Committee Report, American Gas Association.Page14 "The value of the property of the utility upon which the return is to be earned is the rate base."

Considerable thought has been given to valuation theories by the Commissions, the Courts, and the rate and engineering experts of the various companies until today a greater part of the available literature on rates deals with this valuable subject. While the principles of valuation are not a part of the scientific rate structure they are far more important and difficult of determination than the form of rate necessary to raise the required revenue.

For our purpose it is only necessary to discuss briefly the two outstanding rules for valuation as promulgated by the Courts.

a. United States Supreme Court

While the United States Supreme Court has never given its unqualified approval to a single and positive method of valuation they have stated that the valuation in each case is a question of fact to be determined by a consideration of various elements. These elements have led it to be generally understood that the value of public utility property is best measured by a determination of what it would cost to reproduce the property at the time of the inquiry. This determination has been divided into three parts:

1. Fixed Capital

The fixed capital is the value of the property invested in the service of the public. This includes the investment in the manufacturing plants and

Considerable thought has been given to valuation theories by the Commissions, the Courts, and the rate and engineering experts of the various companies until today a greater part of the available literature on rates deals with this valuable subject. While the principles of valuation are not a part of the scientific rate structure they are far more important and difficult of determination than the form of rate necessary to raise the required revenue.

For our purpose it is only necessary to discuss briefly the two outstanding rules for valuation as promulgated by the Courts.

a. United States Supreme Court

While the United States Supreme Court has never given its unqualified approval to a single and positive method of valuation they have stated that the valuation in each case is a question of fact to be determined by a consideration of various elements. These elements have led it to be generally understood that the value of public utility property is best measured by a determination of what it would cost to reproduce the property at the time of the inquiry. This determination has been divided into three parts:

1. Fixed Capital

The fixed capital is the value of the property invested in the service of the public. This includes the investment in the manufacturing plants an

the distribution system.

2. Working Capital

The Courts also make an allowance for the working capital of the company. This consists of the cash, accounts and notes receivable, and inventories of raw materials necessary to operate the utility efficiently.

3. Going Value

In addition to the allowance for fixed and working capitals the Courts make a further allowance for goodwill or going value. Going value is recognized as an element of value in a company that is doing business and earning money over a company that has not been established.' The latest decision of the Supreme Court in the Indianapolis Water Case, October Term, 1926, Number 37 and the three New York City gas rate cases on November 29, 1926 has restated the above principles and accepted present reproduction cost (less depreciation, if any) as the measure of present value.

' American Gas Association, Information Service No. 70, December, 1926. United States Supreme Court Decision in the three New York City gas rate cases. "That there is an element of value in an assembled and established plant doing business and earning money, over one not thus advanced, is self evident. This element of value is a property right and should be considered in determining the value of the property, upon which the owner has a right to make a fair return when the same is privately owned although dedicated to public use."

b. Massachusetts Courts

The state courts in Massachusetts, however, have ruled that the capital actually invested is the proper method of valuation for public utility property. The Public Utility Commission of the state works under this ruling and all of the companies in the state value their property by this method.

Up to the present time no rate cases in Massachusetts have been carried to the United States Supreme Court so that the ruling of the state courts has never been set aside. The present situation among the utilities in the state, however, indicates that in the near future a rate case will be carried to the Supreme Court and will probably result in having the Massachusetts rule changed to agree with the present Supreme Court rule.

5. Rate of Return

Once the important matter of the valuation of the property has been satisfactorily established the next step is to decide tha rate of return to be earned by the utility. The return that the utility should earn must be fair and therefore can not be less than a fair rate of interest. This rate of interest in order to compensate the owners of the public utility for the risk of remaining in business should be substantially higher than the prevailing rate. The Federal and State

6. Massachusetts Courts

The state courts in Massachusetts, however, have ruled that the capital actually invested is the proper method of valuation for public utility property. The Public Utility Commission of the state works under this ruling and all of the companies in the state value their property by this method.

Up to the present time no rate cases in Massachusetts have been carried to the United States Supreme Court so that the ruling of the state courts has never been set aside. The present situation among the utilities in the state, however, indicates that in the near future a rate case will be carried to the Supreme Court and will probably result in having the Massachusetts rule changed to agree with the present Supreme Court rule.

5. Rate of Return

Once the important matter of the valuation of the property has been satisfactorily established the next step is to decide the rate of return to be earned by the utility. The return that the utility should earn must be fair and therefore can not be less than a fair rate of interest. This rate of interest, in order to compensate the owners of the public utility for the risk of remaining in business should be substantially higher than the prevailing rate. The Federal and State

Courts of New York have approved a rate of eight per cent' and this is now the accepted rate of return on investment approved by most of the Public Utility Commissions of the various states.

2. Analysis of Gas Consumers

In the gas industry it is possible to analyize the consumers into definite groups. Gas consumers fall readily into classes that in general have the same requirements for gas service. This classification can be made on the basis of the kind of use required and on the basis of consumption.

a. Steps of Consumption

It has been proved by analysis and experience that those consumers who use the same amount of gas make the same demands upon the manufacturing plant and the distribution system. These facts provide simple means for establishing rates to take care of the requirements of the consumers by steps of consumption. Block rates attempt to distribute the costs equitably between the consumers on this basis. It is possible to construct a block rate where the consumer or service charge is concealed in the first block thus overcoming some of the practical objections to the service charge. The block rate is a step forward but it does not take into consideration the demands of the consumers and thus results in a discrimination between consumers.

' American Gas Association, Information Service No. 59 July, 1925. Three Federal Court Decisions Sustain Right of Gas Companies to Eight Per Cent Return. "The Master has suggested as a reasonable rate of return, not less than eight per cent."

courts of New York have approved a rate of eight per cent[1] and this is now the accepted rate of return on investment approved by most of the Public Utility Commissions of the various states.

2. Analysis of Gas Consumers

In the gas industry it is possible to analyze the consumers into definite groups. Gas consumers fall readily into classes that in general have the same requirements for gas service. This classification can be made on the basis of the kind of use required and on the basis of consumption.

a. Steps of Consumption

It has been proved by analysis and experience that those consumers who use the same amount of gas make the same demands upon the manufacturing plant and the distribution system. These facts provide simple means for establishing rates to take care of the requirements of the consumers by steps of consumption. Block rates attempt to distribute the costs equitably between the consumers on this basis. It is possible to conceal a block rate where the consumer or service charge is concealed in the first block thus overcoming some of the practical objections to the service charge. The block rate is a step forward but it does not take into consideration the demands of the consumers and thus results in a discrimination between consumers.

[1] American Gas Association. Information Service No. 59 July, 1928. "Some Federal Court Decisions Sustain Right of Gas Companies to Eight Per Cent Return. "This Section has suggested as a reasonable rate of return, not less than eight per cent."

b. Classes of Consumers

Consumers are usually classified according to the kind of use to which they put gas service. This classification may be as follows:

1. Domestic
2. Industrial
3. Hotel
4. Restaurant
5. Commercial
6. Street Lighting
7. House Heating

It is possible to develop rates for each of these classes of consumers on the same basis as the allocation of costs shown in the discussion. This further development follows the same principles of allocation as demonstrated but makes a further refinement in that those expenses that can be allocated to certain classes of business are further divided among those classes. By the use of this further analysis and allocation it is possible to build special rates for each class of business. Class rates represent the latest development in scientific rate structures and by their use each class of business can be developed on an equitable basis. Special refinements may be introduced in class rates so as to make them competitive with the rates for fuels other than gas.

c. The Unprofitable Consumer

Careful studies of the kind of consumers that fall into each class by steps of consumption show that those consumers who use less than the amount necessary for

the company to carry them at a profit are not the poor classes but emergency and convenience consumers. These consumers are small stores, theatres, doctors, dentists, and wealth people who have gas for emergency purposes when other kinds of fuel fail. This class of consumer is well able to pay a just rate for the service that they may require. A rate determined by a scientific allocation as explained in the discussion makes this class of consumer pay its proper share of the cost of being ready to serve.

When the service charge form of rate was first introduced it was intended by the public utilities that this form of rate should make this class of consumers pay the costs that they incur by requesting service. The service charge makes each consumer pay his share of the costs of actually being ready to serve but it does not take into consideration the demand elements in gas service.

d. The Profitable Consumer

In the analysis of the consumers it has been proved that the profitable consumers are the so called working classes, the commercial, and industrial classes of consumers. Under most present rate systems these classes of consumers pay the expenses of carrying those consumers whose consumption is less than the average. From practical experience a consumption of less than 2,000 cubic feet per month is considered to be

unprofitable. The percentage of consumers falling into this class runs between sixty and seventy-five per cent of the total consumers. '

The consumers who use over 2,000 cubic feet of gas per month are obliged to pay under a flat rate system the expenses of carrying those consumers who use less than this amount. The profitable consumer thus pays more for his gas per thousand cubic feet than he should.

By the use of the service charge form of rate the profitable consumer is enabled to obtain his gas at a lower rate than under a flat rate system. This encourages the use of more gas and results ultimately in a further reduction of the commodity rate.

111. Application of the Service Charge Rate

While it may not be practical or desirable to establish a rate that takes into consideration the demand factors as developed in the discussion the aacounts of the company and the necessary statistical informationnecessary to determine such a rate should be accumulated so that it would be possible to make a scientific cost analysis.

The cost analysis is very valuable to all the departments of the utility particularly to the operating departments. The use of the cost analysis

'American Gas Association, Report of the 1923 Rate Structure Committee. Page 2. "When costs are properly allocated it will be found that from 60 to 75 per cent of the customers are carried at a loss under existing rates."

in the operatingdepartments leads to a knowledge of cause and effect of conditions and suggests remedies that will lead to the reduction ofoperating costs.

In the discussion that follows the cost analysis is demonstrated for determining a scientific rate rather than the simpler method for determining the actual Consumer Expenses. From the analysis and allocations made as shown in the tabulations it is possible for the rate maker to build any rate that will meet local conditions. The cost analysis should be made and the necessary statistical data accumulated, however, so that the company can determine actual conditions.

The cost analysis should be further applied to the different classes of consumers and the allocations checked with the revenues for the period so that the executives can determine what classes of consumers are paying the costs of furnishing them with gas service.

A service charge form of rate can be determined from the Consumer Cost of the scientific rate and would be approximately the same amount.

The facts and conditions that have been proved regarding the service charge are equally true of the three and four part rates. The fact that the gas company furnishes something in addition to the commodity, gas, has been recognized by the Public Utility Commissions and the Courts in their decisions and orders.

The development of gas rates begins with the flat meter rate which is the same for all consumers. The service charge is the first step in the separation of the Consumer Expenses from the Commodity charge for gas but it does not take into consideration the demand elements of the gas company. The three part rate separates the Commodity, Consumer, and Demand expenses but does not divide the demand element into two parts: the demand on the manufacturing plant and the demand on the distribution system. The scientific rate which might be called a four part rate separates the Commodity, Consumer, Manufacturing Demand, and Distribution Demand Expenses making the commodity charge for gas practically the cost of manufacturing the commodity. Under the scientific rate the commodity cost is the lowest and the cost of gas service is reduced as the consumer increases his consumption.

b. Statistical Data

In order to apply the unit costs obtained by the allocation it is necessary to havecertain information about the classes of consumers. A further step is then taken, which is not shown in the tabulations submitted, by the allocation of the four basic costs determined to the different classes of consumers.

For this purpose accurate records of sales in cubic feet, revenue, and number of consumers must be accumulated for each class of consumers.

The maximum demands of the groups must be determined by studies of a limited number of consumers in each group in order to learn the load characteristics of the class. This study can be accurately made by the use of demand limiting meters. When the coincident demands and load factors of these consumers are determined they can be applied to the whole class on the basis that the demands of the consumers in each class are approximately the same in order to obtain the class maximum demand. The sum of the non-coincident demands of each class gives the non-coincident demand of the system.

By non-coincident demand is meant the sum of the individual maximum demands of all the consumers regardless of the time at which they occur. Coincident demand is the actual maximum demand made on the system.

c. Tabulations

On the basis of the survey made and the necessary statistical data accumulated tabulations are prepared as submitted, from the financial accounts of the company. The allocation of the accounts as discussed and demonstrated is a sound method of analyzing costs but the actual application to a particular company must be made so as to recognize the local conditions that may exist. The work of the rate maker can be greatly assisted by the cooperation of the operating, engineering, executive, accounting, and statistical departments.

TABULATION A

ANALYSIS OF FIXED CAPITAL ALLOCATED TO THREE BASIC COST ELEMENTS

| Account Number | Description of Account | Total Amount | Demand | | Consumer |
|---|---|---|---|---|---|
| | | | Manufacturing | Distribution | |
| 311-a | Land Occupied by Gas Works | 2,000,000 | 2,000,000 | | |
| 311-b | Land Occupied by Outside Pumping Stations | 350,000 | | 350,000 | |
| 312-a | Works and Station Structures | 1,800,000 | 1,400,000 | 400,000 | |
| 313-320 | Station Equipment, including Relief Holders | 11,000,000 | 9,500,000 | 1,500,000 | |
| 312-b | Commercial Holders | 5,000,000 | | 5,000,000 | |
| | Tunnels | 550,000 | | 550,000 | |
| 321 | Mains: | | | | |
| | Transfer Mains | 140,000 | 140,000 | | |
| | Transmission and Distribution Feeders | 13,000,000 | | 13,000,000 | |
| | Distribution Mains | 10,000,000 | | | 10,000,000 |
| 322 | Services | 6,000,000 | | | 6,000,000 |
| 323-324 | Meters | 5,000,000 | | | 5,000,000 |
| 327-a | Main Office Equipment | 325,000 | 50,000 | 50,000 | 225,000 |
| 312-d.1 | Stores: | | | | |
| | Structures | 48,000 | 12,000 | 36,000 | |
| 327-c | Equipment | 15,000 | 4,000 | 11,000 | |
| 311-b.2 | Shops | | | | |
| | Land | 75,000 | | 50,000 | 25,000 |
| 312-d.2 | Structures | 275,000 | | 200,000 | 75,000 |
| 327-b | Equipment | 200,000 | | 150,000 | 50,000 |
| 327-d | Transportation Equipment | 185,000 | 10,000 | 130,000 | 45,000 |
| 328 | Miscellaneous | | | | |
| | Land | 500,000 | 380,000 | 120,000 | |
| | Structures | 65,000 | 50,000 | 15,000 | |
| 326 | Appliances | 400,000 | | | 400,000 |
| | Total Fixed Capital | 56,928,000 | 13,546,000 | 21,562,000 | 21,820,000 |

## TABULATION B

### ANALYSIS OF WORKING CAPITAL ALLOCATED TO THREE BASIC COST ELEMENTS

| Group Numbers | Description of Account | Total Amount | Demand | | Consumer |
|---|---|---|---|---|---|
| | | | Manufacturing | Distribution | |
| 1 | Coal, Coke, and Oil | 235,000 | 235,000 | | |
| 2 | Production Plant Supplies | 65,000 | 65,000 | | |
| 3 | Distribution Department Supplies | 50,000 | | 50,000 | |
| 4 | Pipe,Fittings, Meters, etc. | 185,000 | 4,000 | 80,000 | 101,000 |
| 5 | Appliances | 900 | | | 900 |
| 6 | General Supplies | 70,000 | 25,000 | 10,000 | 35,000 |
| | Gas in Holder | 10,000 | | 10,000 | |
| 7 | Cash and Other Current Assets | 3,500,000 | 900,000 | 1,300,000 | 1,300,000 |
| | Total Working Capital | 4,115,900 | 1,229.000 | 1,450,000 | 1,436,000 |

### SUMMARY OF WORKING CAPITAL AND FIXED CAPITAL

| | | | | |
|---|---|---|---|---|
| Working Capital | 4,115,900 | 1,229,000 | 1,450,000 | 1,436,000 |
| Fixed Capital | 56,928,000 | 13,546,000 | 21,562,000 | 21,820,000 |
| Total Capital | 61,043,900 | 14,775,000 | 23,012,000 | 23,256,900 |
| | 100% | 24.20% | 37.70% | 38.10% |

TABULATION C

ANALYSIS OF OPERATING EXPENSES ALLOCATED TO FOUR BASIC COST ELEMENTS

1. PRODUCTION EXPENSE

| Account Number | Description of Expense | Total Amount | Demand: Manufacturing Amount | Demand: Manufacturing % | Demand: Distribution Amount | Demand: Distribution % | Consumer Amount | Consumer % | Commodity Amount | Commodity % |
|---|---|---|---|---|---|---|---|---|---|---|
| | Production Expense: | | | | | | | | | |
| 701-1 | Works Superintence | 55,600 | 55,000 | 100 | | | | | | |
| 701-4 | Generator Labor | 92,000 | 4,600 | 5 | | | | | 87,400 | 95 |
| 701-5 | Purification Labor | 6,000 | | | | | | | 6,000 | 100 |
| 701-6 | Miscellaneous Work Labor | 52,000 | 52,000 | 100 | | | | | | |
| 705 | Generator Fuel | 900,000 | 45,000 | 5 | | | | | 855,000 | 95 |
| 706 | Enriching Oil | 800,000 | | | | | | | 800,000 | 100 |
| 707-2 | Purification Supplies | 19,000 | | | | | | | 19,000 | 100 |
| 707-3 | Misc. Works Expense | 40,000 | 20,000 | 50 | | | | | 20,000 | 50 |
| | Steam Expense | | | | | | | | | |
| 701-2 | Boiler Labor | 30,000 | 2,400 | 8 | 7,500 | 25 | | | 20,100 | 67 |
| 702-1 | Boiler Fuel | 60,000 | 4,800 | 8 | 15,000 | 25 | | | 40,200 | 67 |
| 702-2 | Water | 7,500 | 600 | 8 | 1,875 | 25 | | | 5,025 | 67 |
| 709-12 | Maint.of Furnaces & Boilers | 7,000 | 560 | 8 | 1,750 | 25 | | | 4,690 | 67 |
| 709-13 | Maint.of Boiler Apparatus | 3,000 | 240 | 8 | 750 | 25 | | | 2,010 | 67 |
| 709-14 | Maint.of Steam Accessories | 2,700 | 216 | 8 | 675 | 25 | | | 1,809 | 67 |
| 711 | Power from Other Sources | 48,000 | | | | | | | 48,000 | 100 |
| 707-4 | Gas Storage (Valve Men) | 5,000 | | | 5,000 | 100 | | | | |
| 708 | Maintenance of Works & Station Structures | 18,000 | 18,000 | 100 | | | | | | |
| | Other Maintenance | | | | | | | | | |
| 709-15 | Maint.Steam Engines | 1,300 | 65 | 5 | | | | | 1,235 | 95 |
| 709-17 | Maint.Misc.Power Equipment | 5,000 | 250 | 5 | | | | | 4,750 | 95 |
| 709-22 | Maint.Water Gas Sets | 61,000 | 3,050 | 5 | | | | | 57,950 | 95 |
| 709-23 | Maint.Purification Apparatus | 3,000 | 150 | 5 | | | | | 2,850 | 95 |
| 709-25 | Maint.Accessory Works Equipment | 17,000 | 850 | 5 | | | | | 16,150 | 95 |
| | Engineering Dept.General Charges | 33,000 | 33,000 | 100 | | | | | | |
| | Holder Stock Adjustment | 200 | | | | | | | 200 | 100 |
| 713 | Residuals Produced-Credit | 103,000 | | | | | | | 103,000 | 100 |
| 710 | Purchased Gas | 3,500,000 | | | 45,000 | | | | 3,455,000 | |
| | Total Production Expense | 5,868,700 | 240,781 | | 77,550 | | | | 5,550,369 | |

TABULATION D

ANALYSIS OF OPERATING EXPENSES ALLOCATED TO FOUR BASIC COST ELEMENTS-CONTINUED

| Account Number | Description of Expense | Total Amount | Demand | | | | Consumer | | Commodity | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Manufacturing | | Distribution | | | | | |
| | | | Amount | % | Amount | % | Amount | % | Amount | % |
| | Transmission & Distribution Expense | | | | | | | | | |
| 721-1 | Distribution Pumping | 239,000 | | | 66,000 | | | | 173,000 | |
| 722-31 | Maint.Trans.& Dist.Bldg.& Fix | 9,000 | | | 9,000 | 100 | | | | |
| 722-32 | Maint.Trans & Dist.Equipment | 15,000 | | | | | | | 15,000 | 100 |
| 721 | Dist.Operating Labor & Equipment | 43,000 | | | 21,500 | 50 | 21,500 | 50 | | |
| 721-21 | Dist.Superintendence | 75,000 | | | 37,500 | 50 | 37,500 | 50 | | |
| 721-22 | Dist.Supplies & Expense | 32,000 | | | 16,000 | 50 | 16,000 | 50 | | |
| 721-32 | Work on Consumers' Premises | 82,000 | | | | | 82,000 | 100 | | |
| 721-4 | Removing & Resetting Meters | 140,000 | | | | | 140,000 | 100 | | |
| 722-33 | Maint.of Gas Appliances | 25,000 | | | | | 25,000 | 100 | | |
| 722-1 | Maint. of Mains | 145,000 | 1,450 | 1 | 79,750 | 55 | 63,800 | 44 | | |
| 722-2 | Maint.of Services | 127,000 | | | | | 127,000 | 100 | | |
| 723 | Maint. of Consumers' Meters | 186,000 | | | | | 186,000 | 100 | | |
| 732 | Maint.of Street Lamps | 1,800 | | | | | 1,800 | 100 | | |
| | Total Distribution Expense | 1,119,800 | 1.450 | | 229,750 | | 700,600 | | 188,000 | |

TABULATION E

ANALYSIS OF OPERATING EXPENSES ALLOCATED TO FOUR BASIC COST ELEMENTS-CONTINUED

3. GENERAL AND MISCELLANEOUS EXPENSES
4. RETURN ON PROPERTY
5. CAPACITY ON SALES BASIS
6. UNIT COSTS

| Account Number | Description of Expense | Total Amount | Demand | | | | Consumer | | Commodity | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Manufacturing | | Distribution | | | | | |
| | | | Amount | % | Amount | % | Amount | % | Amount | % |
| 760 | Commercial Expense | 913,000 | | | | | 913,000 | 100 | | |
| 781-27 | Insurance | 60,000 | 38,000 | | 17,000 | | 5,000 | | | |
| 411 | Rental-Leased Mains | 98,000 | 980 | 1 | 53,900 | 55 | 43,120 | 44 | | |
| 404 | Taxes Excluding Income Tax | 900,000 | 216,000 | 24 | 333,000 | 37 | 351,000 | 39 | | |
| 781-31 | Rentals for Space | 275,000 | 41,250 | 15 | 41,250 | 15 | 192,500 | 70 | | |
| 782 | Retirement Rxpense | 657,000 | 157,680 | 24 | 243,090 | 37 | 256,230 | 39 | | |
| 780 | General & Miscellaneous | 1,000,000 | 200,000 | 20 | 200,000 | 20 | 400,000 | 40 | 200,000 | 20 |
| 403 | Uncollectible Bills | 100,000 | 20,000 | 20 | 20,000 | 20 | 40,000 | 40 | 20,000 | 20 |
| 780 | Contingency | 200,000 | 40,000 | 20 | 40,000 | 20 | 80,000 | 40 | 40,000 | 20 |
| | Return on Property at 8% | 4,883,500 | 1,181,800 | | 1,841,100 | | 1,860,600 | | | |
| | Total of Foregoing Expense | 16,075,000 | 2,137,941 | | 3,096,640 | | 4,842,050 | | 5,998,369 | |
| 404 | Income Tax | 300,000 | 39,000 | 13 | 57,000 | 19 | 90,000 | 30 | 114,000 | 38 |
| 770 | New Business Expense | 325,000 | 42,250 | 13 | 61,750 | 19 | 97,500 | 30 | 123,500 | 38 |
| | Total Costs | 16,700,000 | 2,219,191 | | 3,215,390 | | 5,029,550 | | 6,235,869 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Capacity on Sales Basis | Non-Coincident Maximum 24-Hour Demand 64,000,000 Cu.Ft. | | Non-Coincident Maximum 1-Hour Demand 7,000,000 Cu.Ft. | | Average Number of Consumers 400,000 | | Annual Sales in MC.F. 16,000,000 | |
| | Per 100 Cu.Ft of 24 Hour Demand | | Per 100 Cu.Ft. of 1 Hour Demand | | Per Consumer | | Per MC.F. | |
| | Per Year | Per Month | Per Year | Per Month | Per Year | Per Month | Per Year | Per Mo. |
| Unit Costs | $3.46 | $ .29 | $45.93 | $3.83 | $12.57 | $1.05 | | $.3897 |

TABULATION G

COMPARISON OF SCIENTIFIC RATE WITH VARIOUS OTHER ALTERNATIVE RATES

A. Straight Flat Meter Rate
All gas $1.05 per MC.F

B. Service Charge Rate
Service Charge $.75
All gas $.75 per M C.F.

C. Block Rate
First 400 cu.ft for .75
Next 9,600 cu.ft. @ .85 per M
Next 40,000 " " @ .80 per M
Over 50,000 " " @ .75 per M

D. Block Rate with Service Charge
Service Charge .25
First 2,000 cu.ft. @ .90 per M.
Next 8,000 " " @ .85 per M
Over 10,000 " " @ .80 per M

E. Scientific Rate
Manufacturing Demand $ .29 per 100 cu.ft.of 24 hour demand
Distribution Demand 3.83 per 100 cu.ft.of 1 hour demand
Consumer Charge 1.05
Commodity Charge .3897 per M for gas

| | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| Monthly Consumption | Col. 1 | Col.2 | Col.1 | Col.2 | Col.1 | Col.2 | Col. 1 | Col. 2 | Col. 1 | Col. 2 |
| 400 | .42 | 1.050 | 1.05 | 2.625 | .75 | 1.875 | .61 | 1.525 | 1.45 | 3.625 |
| 600 | .63 | 1.050 | 1.20 | 2.000 | .92 | 1.533 | .79 | 1.317 | 1.56 | 2.600 |
| 800 | .84 | 1.050 | 1.35 | 1.687 | 1.09 | 1.363 | .97 | 1.213 | 1.72 | 2.150 |
| 1,000 | 1.05 | 1.050 | 1.50 | 1.500 | 1.26 | 1.260 | 1.15 | 1.150 | 1.82 | 1.820 |
| 1,200 | 1.26 | 1.050 | 1.65 | 1.375 | 1.43 | 1.192 | 1.33 | 1.108 | 1.96 | 1.633 |
| 1,400 | 1.47 | 1.050 | 1.80 | 1.286 | 1.60 | 1.143 | 1.51 | 1.079 | 2.10 | 1.500 |
| 1.600 | 1.68 | 1.050 | 1.95 | 1.219 | 1.77 | 1.106 | 1.69 | 1.056 | 2.24 | 1.400 |
| 1,800 | 1.89 | 1.050 | 2.10 | 1.166 | 1.94 | 1.078 | 1.87 | 1.039 | 2.33 | 1.294 |
| 2,000 | 2.10 | 1.050 | 2.25 | 1.125 | 2.11 | 1.055 | 2.05 | 1.025 | 2.47 | 1.235 |
| 2,200 | 2.31 | 1.050 | 2.40 | 1.090 | 2.28 | 1.036 | 2.22 | 1.009 | 2.70 | 1.227 |
| 2,400 | 2.52 | 1.050 | 2.55 | 1.062 | 2.45 | 1.021 | 2.39 | .996 | 2.84 | 1.143 |
| 2,600 | 2.73 | 1.050 | 2.70 | 1.038 | 2.62 | 1.008 | 2.56 | .985 | 2.94 | 1.130 |
| 2,800 | 2.94 | 1.050 | 2.85 | 1.018 | 2.79 | .996 | 2.73 | .975 | 3.08 | 1.100 |
| 3,000 | 3.15 | 1.050 | 3.00 | 1.000 | 2.96 | .987 | 2.90 | .967 | 3.18 | 1.060 |
| 5,000 | 5.25 | 1.050 | 4.50 | .900 | 4.66 | .932 | 4.60 | .920 | 4.43 | .886 |
| 10,000 | 10.50 | 1.050 | 8.25 | .825 | 8.91 | .891 | 8.85 | .885 | 5.81 | .581 |
| 25,000 | 26.25 | 1.050 | 19.50 | .780 | 20.90 | .836 | 20.85 | .834 | 13.59 | .542 |
| 50,000 | 52.50 | 1.050 | 38.25 | .765 | 40.90 | .818 | 40.85 | .817 | 24.60 | .492 |

Column 1 Monthly Bills
Column 2 Rate per M C.F.

Tabulation A shows the allocation of fixed capital to the three basic cost elements, Tabulation B shows the allocation of working capital to the same elements. Tabulations C, D, and E show the allocation of the operating expenses and other expenses to the four basic cost elements. Tabulation E further shows the net results of the statistical data in the four capacity figures of non-coincident maximum demand, non-coincident one hour maximum demand, average number of consumers, and annual sales in thousand cubic feet.

By using these four capacity figures as divisors the four unit costs of Manufacturing Demand, Distribution Demand, Consumer, and Commodity on a yearly basis are obtained. By dividing these yearly costs by twelve the monthly charges are obtained. The application of these monthly figures to the consumers demands subject to diversity and the consumption will result in raising the required revenue.

Tabulation F. illustrates how the scientific rate is applied to the gas service used by several consumers having various monthly consumptions and daily and hourly demands.

The daily and hourly demands may be determined in two ways. They can accurately be determined by the use of demand limiting meters. They can be estimated by taking the capacity for gas consumption of the various appliances connected with

the company's mains and considering the probable use of these appliances.

Column 1 of Tabulation F shows the monthly consumption of the various consumers and Columns 2 and 6 show the observed twenty-four hour demand and the observed one hour demand. The rate, however, cannot be applied to these observed demands because of the fact that these demands are not necessarily coincident. There is a diversity between the hours and days selected by the individual consumer for his use of his maximum demand. The actual demand on the system is less than the total of the maximum demands of all of the individual consumers. If the rate were applied to the observed demands of the consumers the total revenue received would be in excess of the amount required to defray the expenses. It is, therefore, necessary to apply a diversity factor to the observed demands in order to obtain the assessed demand. The effect of the diversity factor is to distribute equitably among the consumers the savings in investment charges resulting from the fact that less equipment is required. It is very difficult to determine the diversity factor exactly, so this item is usually a matter of judgment and experience. It can be obtained by studying the load factors of the various consumers and comparing them with the plant load factors. Column 3 and 7 show the diversity factor used for the various consumers and Columns 4 and 8 show the assessed demand after the diversity factor has been applied.

Columns 5 and 9 show the application of the unit demand costs to the assessed demands as shown by columns 4 and 8.

Columns 13 and 14 show the application of these costs: the unit consumer and commodity.

Column 15 shows the total of these costs or the amount of the consumer's bill.

Column 16 shows the costs of gas service in terms of a thousand cubic feet for each step of consumption. This column proves that the application of the scientific rate results in the reduction of the cost per thousand as the consumption increases and that with increased consumption the cost gradually approaches the actual commodity cost of gas service.

Tabulation G is a comparison of several standard forms of rates with the scientific rate.

The rates used are as follows:

A. Straight Flat Meter Rate
B. Service Charge Rate
C. Block Rate
D. Block Rate with Service Charge
E. Scientific Rate

Column 1 of Tabulation G shows the amount of the bill at the various steps of consumption and Column 2 shows the cost per thousand cubic feet figured at the various rates. A study of these comparative figures at the cost per thousand cubic feet shows why the scientific rate encourages long hour use and why its use eliminates discrimination between consumers.

Rate B is a service charge rate and the application in Column 1 shows that the cost of gas service is reduced as the consumption is increased . Column 2 shows more clearly that the cost per thousand cubic feet is reduced as the consumption increases.

## 2. How the Service Charge Rate Effects Consumers

In the study and analysis of gas consumers under a flat meter rate system the following conditions are found to be true. One third of the consumers fail to pay operating expenses, another third pay operating expenses but fail to pay a return on investment, and the last third pay operating expenses and return on investment and in addition carry the losses of the two thirds of the consumers who do not pay their proper share of the expenses. ' These conditions are true to a certain extent in any rate system except the scientific rate discussed.

' Brief for Grand Rapids Gas Light Company. State of Michigan Before the Michigan Public Utilities Commission. D1649 by W. F. Douthirt. Page 17. "1. One third of the consumers just about exactly paid operating expenses and practically nothing for profit or return. 2. Another one third paid operating expenses and contributed about one half of what they ought to have contributed towards profit or return. 3. The remaining one third of the consumers made up the operating loss caused by the first one third and also contributed all that the first one third ought to have contributed towards profit and return, and also contributed towards profit or return about one half of what the second one third ought to have contributed."

What is true in the application of a service charge rate to a group of consumers is also true of a scientific rate application to a greater degree. The conclusions that are drawn for the service charge may also be drawn for the scientific rate except that the equity of the scientific rate is greater and discrimination between consumers is eliminated.

a. The Unprofitable Consumer

We have seen that the unprofitable consumer is not the poor working man but the convenience and emergency consumers. The company incurs a considerable expense in being ready to serve this type of consumer. This expense continues whether gas is used or not. The consumer has the choice of whether he desires gas service and he is directly responsible for the ready to serve expenses that he incurs.

The service charge rate assesses these expenses directly to the consumer and he should be willing to pay his share of these expenses of being ready to serve him. The practical result of the application of the service charge is to discourage this type of consumer from requesting gas service if he does not desire to pay his just share of the expenses. This is to the advantage of the company as under a flat rate system they are carrying a considerable number of their consumers at a loss.

Those consumers who comprise the upper third of the unprofitable consumers, that is the class who pay operating expenses but fail to pay a return on investment, are, however, encouraged to increase their consumption in order to obtain a lower rate per thousand cubic feet. This results in increasing the number of consumers who are profitable and in increasing the consumption of the present consumers, which is the goal of all rate systems.

b. The Profitable Consumer

The profitable consumer who comprises under a flat rate system approximately one third of the consumers is encouraged to increase his consumption of gas in order to obtain lower rates per thousand cubic feet.

The practical result of the application of the service charge to the industrial consumers is to materially reduce the amount of their monthly bills by the elimination of the consumer expense concealed in the flat rate.

The smaller rate for increased consumption encourages the industrial consumers to use more gas and to find new uses for gas service in their plants.

IV. What the Service Charge Is?

At the time this form of rate was first introduced the use of the word "Service" was popular so it was adopted for the new rate form. The choice was unfortunate in that this word is overworked and inasmuch

as it does not convey the real meaning of what this form of rate attempts to accomplish. If the word "Customer" or Consumer" was used this form of rate would have been more popular and the public would not have been misled as to its real purpose.

1. An Adjustment of Costs Between Consumers.

In the final analysis the two part rate is an attempt to adjust the costs of operating the utility between the different classes of consumers. We have proved in the discussion that under a flat rate system the majority of the consumers are served at a loss and that the necessary expenses are borne by a few of the consumers.

Under the service charge form of rate those expenses that are caused by the consumers are determined separately and divided equally among the consumers. The method of building the rate as shown by the tabulations proves that the necessary expenses are divided into two classes; one class covering the operating expenses and the other class covering the expenses caused by the consumer in being ready to serve him.

By separating these two classes of expenses it is possible to have a lower rate for the gas consumed and at the same time charge each consumer his proper share of the ready to serve costs.

## 2. Does the Company Benefit Directly by The Service Charge

The company itself is not directly interested in the form of rate charged for gas service. Under the system of public regulation the utility is entitled to earn a revenue that will pay the operating expenses, provide for depreciation, and earn a fair return on the property invested. This result can be accomplished by a flat rate or any of its modifications.

We have proved, however, that the flat rate is inequitable inasmuch as each consumer pays the same rate per cubicfoot for gas irrespective of whether he uses one hundred cubic feet or one hundred thousand cubic feet. We have further shown that under a flat rate approximately on third of the consumers pay the expenses of operating the utility.

What is the benefit that the company receives by the introduction of a service charge or a scientific rate? Equitable rates benefit the company indirectly in two ways: first they charge the same price for gas used as a commodity to each consumer, and second they assess each consumer his proper share of the Consumer and Demand Expenses.

The result of the introduction of equitable rates is to increase the consumption of the present consumers and eliminate discrimination between consumers as shown in the discussion. This ultimately results in the reduction of the commodity rates to all of the consumers.

## V. Legal Opinions on the Equity of the Service Charge

It is not the intention of the writer to quote from the decisions of the Courts and the orders and recommendations of the various Public Utility Commissions. The service charge form of rate has been approved by the Utility Commissions in thirty-eight States of the Union and upheld by every Court which has passed upon it in this country.' The cases have been very carefully studied through the Public Utility Reports and the Service Letters of the American Gas Association and much of the material for the discussion was obtained from these sources. These cases are cited by reference in Part IV of Sources of Information.

The study of these decisions and cases clearly shows that the Courts and Public Utility Commissions realize that any form of a flat meter rate is inequitable and results in discrimination between consumers. They also in their opinions and orders recognize the fact that a gas company furnishes something in addition to the commodity which they manufacture and that the utility incurs considerable expense in being ready to serve their consumers.

'The Service Charge as a Part of the Rate for Gas by William L. Ransom. Page 16. "The inclusion of a "service charge" as a part of the rate for gas is either required or approved by the regulatory Commissions in 38 States of the Union, and has been disapproved by none, so far as the records show. It has been upheld by every Court which has passed upon it in this country, and disapproved by none."

Some of the Public Utility Commissions have gone further than approving the two part rate and have upheld the three part rate. This is a distinct forward movement and shows the tendency of theCommissions to follow the principles of scientific allocation and analysis of costs as developed by the American Gas Association Committees on Rate Structure and Cost Accounting and discussed in this thesis.

1. Three Part Rate Upheld

On November 29, 1922 The Kansas Public Utilties Commission after a two and one-half years' trial and an extensive investigation of the practical working of the Three-Part Rate of the Ottawa Gas and Electric Company held that consumers are benefited by its installation and that the results recommend its continuation. '

On March 22, 1927 The Alabama Public Service Commission, one of the more progressive utility commissions, approved in the case of the Muscle Shoals Gas Company a modern scientific rate based upon the same principles as discussed in this thesis. The Commission states that its responsibility is to construct and approve a rate which will equitably distribute among all classes of consumers the cost of servicerendered.''

'American Gas Association. Information Service No. 40
February, 1923

''American Gas Association. Information Service No. 73
April, 1927.

## VI. Objections to the Service Charge

The numerous objections to the service charge form of rate may be classified and discussed briefly under two headings:

### 1. Is the Service Charge a Meter Rental?

Inasmuch as the service charge was first introduced as an increase in ratesduring the period after the World War many consumers were led to believe by politicians and municipal officers that the service charge was a meter rental in disguise. To the large number of convenience and emergency consumers whose bills were materially increased by this form of rate this appeared to be the logical result of the application of this rate.

We have shown in the discussion that the service charge is not a meter rental but is in fact an attempt to make each consumer bear his share of the costs of being ready to serve him.

### 2. Does the Service Charge Result in an Unjust Discrimination

The introduction of this form of rate results in the complaint that the rate places unfair burdens on the poor working classes and small consumers and discriminates against them to the benefit of the large consumers.

In the discussion we have proven that the rate does not discriminate but assigns the costs of being ready to serve equitably among the various classes of

consumers.

Three facts are proven as to the non-discriminatory character of the service charge rate:

a. Rate Applies Equally and Impartially to All Consumers

We have shown that the service charge as applied is the same for all the consumers: that the small consumers pay the same amount for the service charge part of the rate as the large consumer. Each consumer pays the same service charge each month for the company's readiness to serve him and the same commodity price per thousand cubic feet for whatever quantity of gas actually consumed. This proves that the rate applies equally and impattially to each consumer.

b. Rate Varies With the Number of Consumers

As shown in the discussion the Consumer Costs of the gas company vary in amount with the number of consumers and not with the quantity of gas sold, whereas the Commodity Costs vary in amount with the quantity of gas sold. Therefore, when the Consumer Costs are apportioned equally to each consumer and paid by each consumer and not included in the rate for gas consumed, the service charge rate is more equitable than a flat meter rate or any of its modifications.

c. Rate Represents the Cost of Service Rendered

A study of the decisions of the Courts and Commissions as applied to any type of water, gas,

electric, telephone, and railroad rates proves that any rate that makes the consumer pay the the expenses of furnishing him with the service which he receives is fair, reasonable, and non-discriminatory.

In fact some of the regulatory bodies have gone further by stating that any form of rate which makes one consumer or class of consumers pay more for their service than the cost of rendering it merely to enable other consumers to receive similar service at less than cost is unjustly discriminatory. In other words they state that a rate not based on a scientific cost of service allocation in some form is discriminatory.

VII. What the Public Thinks of the Service Charge

In the introduction of a new form of rate the public and authorities must be educated to understand just what the new form of rate attempts to accomplish. The gas industry with a long period of public service and a comparative slow growth with flat rates have accustomed the ordinary person to think that a flat rate is the proper rate for gas service. Any departure from the flat rate is instantly met with opposition by the public, politicians, and municipal law officers.

The reactions that the public has to the service charge may be classified under four headins:

1. A direct Tax

They think that it is a direct tax inasmuch as it is the same for each consumer. When the service

charge is graduated and the graduations are based on the size of the consumer's meter the public thinks that it is a meter rental.

2. It is Not Part of the Rate for Gas

The public has been accustomed so long to a flat rate per thousand cubic feet for gas that any form of rate that divides the rate into two or three parts does not in their opinion appear to be fair or equitable.

3. It Increases the Gas Bills

The public considers that the Commodity part of the service charge rate is equivalent to the flat rate and that the service charge part of the rate is something in addition to the rate thus resulting in a substantial increase in their gas bills.

4. It Provides Additiohal Revenue for the Company

The first reaction that the public has to a service charge rate is that it is something in addition to the rate for gas thus increasing the company's revenue without providing an‡thing in return.

Part Three

Conclusion

## Conclusion

From our study of the service charge form of rate and the more recent development of the scientific rate we can draw the following conclusions:

### 1.Makes the Small Consumer Pay his Fixed Cost

In the discussion we have shown that a gas company furnishes something in addition to the commodity which it manufactures and that the fact that the company must distribute the commodity to the consumer in any quantity and at any place or time creates many expenses that have nothing to do with the quantity of gas sold. Thses expenses of distribution are the same for the large consumer as the small consumer inasmuch as each consumer incurs these expenses when he requests service.

Under a flat meter rate or its modifications each consumer pays the same rate for his gas service irrespective of the quantity consumed. Under this form of rate the large consumer carries the burden of paying the expenses caused by the small unprofitable consumer.

The service charge and more particularly the scientific rate assesses each consumer his fair share of the cost of being ready to serve. Each consumer pays the same amount for being ready to serve and no class of consumers pay more than their fair share. Under these forms of rate structures the small consumer must pay his just share of the costs he incurs whether he uses any gas or not.

2. Encourages Increased Consumption

The goal of all rate systems is to increase the consumption of gas of the present consumers of the company and add new consumers. The service charge and scientific rate by making the Commodity Cost for gas as low as possible encourages the present consumers to use more gas in order to receive the benefit of the lower rate per thousand cubic feet with an increased consumption.These rates tend to make the present unprofitable consumers use moregas in order to receive the benefit of the lower rate.

3. Lowers the Rate for the Large Consumers

Under a flat meter rate system we have shown that the large consumer pays more for his gas than he should and that he makes up the losses incurred by the small consumer.

Under the service charge and scientific rate forms the large consumer pays very nearly the actual manufacturing cost for the gas he consumes. As the consumption increases under these rate forms the cost per thousand cubic feet decreases and gradually approaches the manufacturing cost of the gas.

## II. A Prediction for the Future

The possibilities for the development of gas for domestic purposes through the all gas kitchen, house heating, industrial purposes are tremendous. The demand for gas for house heating and industrial uses is growing rapidly in spite of present rate systems.

In order to develop this potential business it is essential to introduce rates that will be competitive with the rates for otherkinds of fuel.

The consumers must be educated to the fact that the service charge and scientific rate structures result in lower rates with increased consumption. These rates when properly determined and allocated to the differentclasses of consumers can be low enough to compete with the rates for other fuels.

We have shown that rates should be just, reasonable, sufficient, non-discriminatory and non-preferential. A reasonable and just rate is one that is just to the utility and to each individual consumer. It must be sufficient to raise the required revenue. It must be reasonable in that the expenses of operation, general expenses, and rate of return are fair and warranted for the circumstances and conditions under which the utility operates. It must be sufficient in order to encourage additional investment to improve the service to the public. A rate must not be preferential or unjustly discriminatory by being greater or less than that charged any other person for a like and contemporaneous service. A rate must not be unjustly

discriminatory by requiring a certain class or classes of consumers to pay the costs caused by another class or classes.

The ideal rate, however, is the scientific or theoretically perfect four part rate as developed in the discussion and would be as follows:

Consumer

All consumers shall be charged an equal amount per year

Manufacturing Demand

Service shall be sold at a rate per year per 100 cubic feet of twenty-four hour demand.

Distribution Demand

Service shall be sold at a rate per year per 100 cubic feet of one hour demand

Commodity

All gas shall be sold at a rate per 1,000 cubic feet in accordance with meter statement

While it may not be practical in many cases to introduce a scientific rate in the four part form the scientific allocation of costs should be made and the actual rate constructed from the costs so determined.

The gas industry is now introducing block rates with a concealed service and demand charge, optional rates, class rates, and trial rates. Gradually as the public and authorities are educated to the principles of scientific rate structure the three part rate will become the basic rate of all gas companies.

In closing it might be well to quote the motion adopted at a joint conference of the members of the Executive Board of the American Gas Association on May 18, 1921.

> "The service charge which should be advocated is that which is the most inclusive one, that is, that service charge which embraces both the customer charge and demand charge, and that we should only depart from that as a comprise, conditioned upon the necessity of expedients, such as the cost of limiting devices, state regulation, terms of franchises, or public opinion."

Finis

Part Four

Sources of Information

# Part Four

## Sources of Information

### I. Bibliography

#### General

"Brief for Grand Rapids Gas Light Company"
February 5, 1923 by W. F. Douthirt
Vice-President American Light and Traction Company, New York

"Picture Ahead"
1923. Associated Gas Industry
In connection with the Home Beautiful Exposition, Boston

"Service Charge"
Citations from the Commissions
Arranged by T. C. O'Hare,
Charles H. Tenny Company, Boston

"Rate Structure"
"Definitions of Terms" and "Theories of Allocation"
Complied from various papers by Rate Committee of the Peoples Gas Light and Coke Company, Chicago, Illinois. 1922.

"Consumer Charge Explained"
by A. B. Tenney, President of the
Suburban Gas and Electric Company
Malden and Melrose Gas Light Company
Malden Electric Company

Various News Items and Editorials appearing in the Boston Papers during the latter part of 1922 and the early part of 1923.

Editorials, interviews, and articles prepared by the Winthrop Sun during 1922.
"The Service Charge"
"The Consumer's Charge As a Saving and How It Can be Proved"
"How to Get All Round Justice"
"How the Service Charge is Operating in the Suburban Gas and Electric Plant"

"Equitable Gas Rates" Pages 253-261
S. Waldo Coleman
"Analyzing Gas Costs and Sales" Pages 262-289
"Where We Stand in Rate Making for Gas or Electricity"
#S. G. Vincent, Junior
J. M. Spitzglass Pages 291-368
Proceedings of the Twenty-Fourth Convention of the Pacific Coast Gas Assoication. September 19-21 1916

"Special Bulletin"
Rate Structure Committee, April, 1923

"Rate Structure"
Report of the 1923 Committee
American Gas Association
Appendix A.
"Cost of Service and Rates Based on Same"
by Ewald Haase
AppendixB.
"Short Discussion on the Allocation of Costs"
by G. I. Vincent
Appendix C.
"Court and Commission Decisions"
by F. L. Daily
Appendix D.
"Tabulation of Types of Rates"
Appendix E.
"Preparationof Rate Cases"
by F. C. Hamilton
Appendix F.
"Bibliography of Rates (1876-1923)
by O. E. Norman

"Wholesaling Gas or Organizing a Department to Sell Gas in Wholesale Quantities"
1925 Convention American Gas Association
by L. C. Harvey, Illinois Power and Light Corp. Chicago, Illinois
and H. H. Clark, The Peoples Gas Light and Coke Company, Chicago, Illinois

"Rate Structure"
Report of 1925 Committee
American Gas Association
Appendix 1.
"A Study in Class Rates"
by Ewald Haase
Appendix 2.
"Rates for Househeating"
by Theodore V. Purcell

"Rates for Industrial Gas "
1925 Convention. American Gas Association
by Theodore V. Purcell

" Report of the Committee on Analysis of Gas Company Statistics"
1925 Convention. American Gas Association

"Development of Cost Analysis for Gas Companies"
by R. H. Knowlton

"Selling Gas for House Heating"
1926 Convention. American Gas Association
by H. Leigh Whitelaw

"Industrial Gas Survey"
1926 Convention. American Gas Association
by Ralph H. Manier, Syracuse Lighting Company
Syracuse, New York

"Rate Structure"
Report of the 1926 Committee
American Gas Association
Appendix I.
"Principles of Rate Making for Gas Utilities"
Appendix II
"Off Peak or Seasonal Rates"
Appendix III.
"Practical Rate Making"
Appendix IV.
"Rate Bibliography"
Appendix V.
"Decision re-Optional Rates"

"Rate Fundamentals"
1926 Convention. American Gas Association

"Report of Committee on Statistics and Cost Accounting"
1926 Convention. American Gas Association

"Report of the Department of Public Utilities on the subject of Service Charges for Gas and Electricity, submitted to the Senate and House of Representatives of Massachusetts" January 5, 1921. House No. 2

Massachusetts Department of Public Utilities- Decisions and Findings
Service Charge - in re Malden Electric Company
May 12, 1922 (D. P. U. 548.
Petition of the Worcester Gas Light Co.
June 9, 1922 (D. P. U. 587)
In re Worcester County Gas Company
February 17, 1922. ( D. P. U. 630)
Petition of the Gardner Gas, Fuel, and Light Co.
July 13, 1922 (D. P. U. 526)
Petition of the Malden and Melrose Gas Light Co.
April 14, 1922 (D. P. U. 549)
Petition of the Suburban Gas and Electric Co.
May 12, 1922 ( D. P. U. 547)

"Quality and Cost of Production and Distribution of Gas Supplied to Government and Private Consumers in the District of Columbia"
Report to Congress by the Bureau of Standards
Washington Gas Light Company, December 6, 1920.

"Petition Protesting Against a Service Charge and an Increase in the Price of Gas"
Excerpts from the Decision of the New Hampshire Public Service Commission. In the Caseof No. D 434
Charles Kinch et al. v. Concord Light and Power Co.

"Uniform System of Accounts for Gas and Electric Companies"
Prescribed by the Department of Public Utilities of Massachusetts. Effective July 1, 1921.

"One Hundred Years Since Gas First Lit Boston's Path to Modernity"
An Article appearing in the Boston Transcript December 28, 1921 by James Ernest King

"Going Value"
Decisions of the Courts and Commissions from July 1, 1924 to July 1, 1925.
Compiled by William L. Ransom of the New York Bar

"The Development of Scientific Rates for Electricity"
Published by the Detroit Edison Illuminating Company. Detroit, Michigan in 1915.

This book contains the following famous rate papers:

"On the Cost of Electric Supply"
by Dr. John Hopkinson (1892)

"A Method of Calculating the Cost of Furnishing Electric Current and a Way of Selling It"
by W. J. Greene (1896)

"Cost of Electricity Supply"
by Arthur Wright (1896)

"Equitable, Uniform and Competitive Rates"
by Henry L. Doherty (1900)

"High Efficiency Lamps - Their Effect on the Cost of Light to the Central Station"
by S. E. Doane (1910)

"Demand and Diversity Factors and Their Influence on Rates"
by J. R. Cravath (1910)

"Effect of Width of Maximum Demand on Rate Making"
by Louis A. Ferguson (1911)

"Reasonable Profit - Its Definition, Collection, and Distribution"
by James V. Oxtoby (1910)

United States District Court Southern District of New York
In Equity: No. E 26 - 366
Consolidated Gas Company of New York, Plaintiff
against
The Public Service Commission of the Stateof New York, Defendants
Opinion and Final Decree of Winslow, D. J.
Confirming the Findings, Report and Opinion of the Special Master. James G. Graham

"Concerning Depreciation"
Testimony given before the Interstate Comerce Commission on November 22, 1923.
Docket No. 15100
by Mr. Robert A Carter
Vice-President of the Consolidated Gas Company of New York.

"Depreciation Charges Under the Interstate Commerce Act"
A Memorandum Filed with the Depreciation Section of the Bureau of Accounts of the Interstate Commerce Commission
by Mr. Robert A. Carter
Chairman of the Committee on Rate Fundamentals of the American Gas Association
and
Mr. William L. Ransom of the New York Bar

"Depreciation Charges of Railroads and Public Utilities"
by Mr. Robert A. Carter and
Wiliam L. Ransom

United States District Court - Southern District of N. Y.
( In Equity No. E-26-371)
The Bronx Gas and Electric Company, Plaintiff
against
The Public Service Commission of New York, Defendants
Opinion and Report of the Special Master. J. G. Graham

United States District Court - Eastern District of N. Y.
In Equity 1275
Brooklyn Borough Gas Company, Plaintiff
against
The Public Service Commission of the State of New York, Defendants
Opinion and Report of the Special Master

United States District Court - Eastern District of N. Y.
In Equity No. 1268
New York and Richmond Gas Company, Plaintiff
against
The Public Service Commission of the State of New York
Defendants
Opinion and Report of Honorable Appleton L. Clark, Special Master
Final judgment and decree, modifying and confirming the report and opinion of the Special Master

United States District Court - Southern District of N. Y..
In Equity: No. E-26-367
New York and Queens Gas Company, Plaintiff
against
The Public Service Commission of the State of New York, Defendants
Opinion of Winslow, D. J., Modifying and Confirming Report of Special Master
Opinion and Report of Special Master

Supreme Court of the United States
N. 357- October Term, 1926
Attorney-General of the State of New York, Appellant
vs.
Consolidated Gas Company of New York
No. 358
The Brooklyn Union Gas Company
No. 365
Kings County Lighting Company

Indianapolis Water Company Case
Opinion of Mr. Justice Butler
Opinion of Mr. Justice Brandeis

"Manufactured Gas"
by Professor Jerome J. Morgan, Columbia University
New York City, New York.

Loaned from the Files of the Boston Consolidated Gas Co.

"The Romance of the Gas Industry"
1922 by Oscar E. Norman of the
Peoples Gas Light and Coke Company, Chicago

"The Principles of Gas Rate Making"
1921 by F. C. Freeman of the
Providence Gas Company, Providence

"How Far are We Justified in Applying the Cost of Service Principle in the Gas Industry"
1922 by Hon. Carl D. Jackson, President
National Association of Railway and Utilities Commissioners

"The Need of Readjusting Gas Rates to Meet Present Day Conditions"
1920 by George H. Priest of the
New England Association of Gas Engineers

"The "Readiness - To - Serve" Cost of Gas Supply"
1908 by W. H. Gardiner
New England association of Gas Engineers
Proceedings of 1908 Convention

Loaned from the Files of the American Gas Association, New York City, New York

"TheService Charge as a Part of the Rate for Gas"
1921. by William L. Ransom of the New York Bar

"Report of the Rate Committee"
1922. Indiana Gas Association

"Doherty Method of Charging for Gas"
by Robert G. Griswold of the Henry L. Doherty Co.

"Analysis of Costs Applicable to A Service Charge"
1920. F. C. Freeman, Engineer, Providence Gas Co.

"Elimination of Discrimination in Public Utility Rates by "Readiness-To-Serve" Charges"
1918. Samuel S. Wyer, Consulting Engineer, Columbus, Ohio.

"Report of the Rate Structure Committee of the American Gas Association" 1921.

"Principles of Gas Rate Making"
1921. F. C. Freeman, Engineer, Providence Gas Co.

Articles from the Writer's File of the American Gas Association Monthly

"Service Charge versus Minimum Rate"
Volume II. Number 10. October, 1920. Page 600

"The Public Utility Company in Court"
An Address Before the Annual Meeting of the American Gas Association at the Hotel Pennsylvania, New York Cityon November 18, 1920
by William L. Ransom of the New York Bar
Volume II. Number 12. December 12. December, 1920 Page 731

"Some Recent Judicial Rulings as to the Rate Base"
by Louis L. Benedict
Volume III. Number 2. February, 1921. Page 80

"Gas Service Costs in a Rate Structure" (Revised)
by L. R. Dutton, Jenkintown, Pennsylvania
Prepared for the Canadian Gas Association, Montreal, Canada, August 25-26, 1921.
Volume III. Number 11. November, 1921. Page 579

"The Preparation and Presentation of Rate Cases Before Commissions"
by William G. Woolfolk, Chicago, Illinois
Volume III. Number 12. December, 1921. Page 649.

"Changes in Utility Rates"
From Public Utility Reports
Volume IV. Number 8. August, 1922. Page 466.

"Thoughts on Rate Making"
by R. B. Brown, General Manager, Milwaukee Gas Light Co.
Volume IV. Number 8. August, 1922. Page 465.

"How Far are We Justified in Applying the Cost of Service Principle in the Gas Industry"
by Hon. Carl D. Jackson, President Naiional Association of Railway and Utility Commissioners

Volume IV. Number 11. November, 1922. Page 647.

"The Importance of Accounting in Rate Cases"
by A, W. Teele of Patterson, Teele, and Dennis, N. Y.
Volume IV. Number 12. December, 1922. Page 723.

"Rpport of the Rate Fundamentals Committee"
by R. A. Carter, Chairman, New York City
Volume VI. Number 1. January, 1924. Page 17.

"Tragedy of Starvation Rate"
From April issue of "Public Service Management"
Volume VI. Number 5. May, 1924. Page 259.

"Rate Structures with a Service Charge"
by H. G. Wells, Member of the Public Service Commission of Massachusetts
Volume VI. Number 7. July, 1924. Page 387.

"Paris Celebrates a Century of the Gas Industry"
Reprinted from the Boston Evening Transcript
by Alvan F. Sanborn
Volume VI. Number 9. September, 1924. Page 547

"Valuation for Rate Making"
by J. A. Emery, Vice-President of Ford, Bacon, and Davis, New York City.
Volume VI. Number 10. October, 1924. Page 579.

"Going Value" as an Element in Utility Rate Base"
From the New York Sun
by Thomas F. Woodlock
Volume VII. Number 2. February, 1925. Page 72.

"Public Relations"
by B. J. Mullaney
Volume VII. Number 2. February, 1925. Page 75.

"City Recognizes Service Charge"
Volume VII. Number 2. February, 1925. Page 90.

"Hidden Costs and How to Find Them"
by A. B. Greenleaf, Peoples Gas Light and Coke Company, Chicago, Illinois
Volume VII. Number 3. March, 1925. Page 131.

"New Rates Must Precede Progress"
by H. O. Loebell, Chairman of the Sub-Committee on Rates and Rate Structures of the American Gas Association
Volume VII. Number 4. Rpril, 1925. Page 248

"To Gather Data on New Rate Structures"
Volume VII. Number 5. May, 1925. Page 297.

"The Trend of Gas Rate Structurein the United States"
A Comparative Study of the Rates Appearing in Rate Lists Nos. 1, 2, and 3.
by A. Gordon King, Service Engineer of the American Gas Association
Volume VII. Number 6. June, 1925. Page 327.

"The Value of Service in Competing with Other Industrial Fuels"
by E. H. Ledgard, Consumers Power Company, Flint, Michigan
Volume VII. Number 6. June, 1925. Page 345

"Selling Easter Eggs and Gas Service"
Rate Making from the View Point of the Customer
by C. S. Reed. A. G. A. Rate Structure Committee
Volume VII. Number 10. October, 1925. Page 585.

"Where There's a Will There's Househeating"
by George L. Horning, Utah Gas and Coke Company
Volume VII. Number 12. December, 1925. Page 719.

"The Effect of Rate Structure on the Customer and the Gas Company"
by C. S. Reed. A. G. A. Rate Structure Committee
Volume VIII. Number 1. January, 1926. Page 19.

"The Area Rate Applied to Gas Service"
by V. E. Bird, The Connecticut Power Company
Volume VIII. Number 2. Fevruary, 1926. Page 89.

"How One Gas Company Advertised for a Rate Increase"
by Thomas J. Mercier
Volume VIII. Number 2. February, 1926. Page 111

"Are We Peculiar?"
The Gas Industry Should not be Content to Continue with Meter Rates"
by C. S. Reed. A. G. A. Rate Structure Committee
Volume VIII. Number 5. May, 1926. Page 267.

"Why Monopolize the Word "Monopoly"
by C. S. Reed. A. G. A. Rate Structure Committee
Volume VIII. Number 8. August, 1926. Page 469.

"Three Part Rate is Success in Topeka"
by Fred Karr, Director of Public Relations,
The Gas Service Company.
Volume VII. Number 9. September, 1926. Page 359.

"Salient Sayingsof Convention Speakers"
Philip Cabot, Cambridge, Mass. Page 651.
C. S. Reed, New York, N. Y. Page 662.
Volume VIII. Number 11. November, 1926.

"Building a Rate to Build the Business"
by Charles S. Reed, Consulting Engineer, New York
Volume VIII. Number 12. December, 1926. Page 717.

"Practical Use of the Degree Day Method of
Comparing Gas Heating Costs"
by Eugene D. Milener, Baltimore, Maryland.
Volume VIII. Number 12. December, 1926. Page 709

II. Correspondence

Mr. T. V. Purcell
Chairman, 1923 Rate Structure Committee,
American Gas Association
With The Peoples Gas Light and Coke Company
Michigan Avenue at Adams Street, Chicago, Illinois

Mr. Alfred I. Phillips
Gas Engineer
With Arthur D. Little, Incorporated
Chemists, Engineers, Managers
Charles River Road, Cambridge, Massachusetts

Mr. Charles H. B. Chapin
Secretary The Empire State Gas and Electric Association
Grand Central Terminal, New York City, N. Y.

Mr. J. M. Spitzglass
With the Republic Flow Meters Company
2240 Diversity Parkway, Chicago, Illinois

Mr. L. R. Dutton
Division Manager
Philadelphia Suburban Gas and Electric Company
Jenkintown Division, Jenkintown, Pennsylvania

Mr. W. F. Doughirt
Vice-President
American Light and Traction Company
120 Broadway, New York City, New York.

Mr. Oscar H. Fogg
Secretary The American Gas Association
420 LexingtonAvenue, New York City, New York

Mr. Alexander Forward
Managing Director. The American Gas Association
420 Lexington Avenue, New York City, New York

Mr. William B. Orme
Secretary. The Washington Gas Light Company
Washington, D. C.

Mr. William T. Gunnison
Chairman, The New Hampshire Public Service Commission
Concord, New Hampshire

Mr. Clifford Johnstone,
Executive Secretary, Pacific Coast Gas Association
Wells Fargo Building, San Francisco, California

Mr. Walter M. Berry,
Executive Engineer, The California Gas Research Council
1113 National City Bank Building, Los Angeles, Cal.

Mr. R. V. Prather
Secretary and Treasurer, Illinois Gas Association
305 Illinois Mine Workers Building, Springfield, Illinois

Mr. Henry L. Ransom
Rate Attorney and Member of firm of
Whitman, Ottinger Ransom, Coulson, and Goetz
120 Broadway, New York City, New York

Mr. Samuel C. Mumford
Treasurer
The Detroit Edison Illuminating Company
Detroit, Michigan

Mr. Charles S. Reed
Rate Consultant of the American Gas Association
130 East 15th. Street
New York City, New York.

III. Conferences

Mr. T. C. O'Hare
Rate Expert
With the Charles H. Tenney Company
Boston, Mass.

Mr. Alfred I. Phillips
Gas Engineer
With the Arthur D. Little Company
Cmabridge, Mass.

Dr. J. F. Wing
Vice-President
With the Boston Consolidated Gas Company
Boston, Mass.

Mr. J. C. D. Clark
Service Manager
With the Boston Consolidated Gas Company
Boston, Mass.

III. Conferences

Mr. T. C. O'Hare
Rate Expert
With the Charles H. Tenney Company
Boston, Mass.

Mr. Alfred I. Phillips
Gas Engineer
With the Arthur D. Little Company
Cmabridge, Mass.

Dr. J. F. Wing
Vice-President
With the Boston Consolidated Gas Company
Boston, Mass.

Mr. J. C. D. Clark
Service Manager
With the Boston Consolidated Gas Company
Boston, Mass.

## IV. Cases and Reports on the Service Charge

### Meter Rent Cases.

Meek v. Consumers Electric Light &Power Co.
P. U. R. 1915 A 982 (Mo.)

Charlesworth v. Omro Electric Light Co.
P. U. R. 1915 B 13 (Wis)

Apple v. Brazil
P. U. R. 1915 C 582 (Ind)

Bosshard v. Hussa Bros. Light & Water Co.
P. U. R. 1915 E 588 ( Wis.)

Bloomington Gas Co. v. Albert W. Holmes
Illinois Circuit Court
American Gas Light Journal April 2, 1872 Vol. 16 p. 104.

Kauffman v. Hillsboro Light & Power Co.
P. U. R. 1916 E 379 ( Wis.)

### Service Charge, etc.

In re Ladysmith Lighting Co.
P. U. R. 1915 A 1065 (Wis.)

Le Roy v. Pavilion Natural Gas Company
P. U. R. 1916 D 137 (New York) (2d)

State of Louisiana v. Sloan
Louisiana Supreme Court
P. U. R. 1916 E 1015

Moritz v. Edison Electric Illuminating Co.
P. U. R. 1917 A 407 (New York 1st. Dist.)

Ben Avon Borough v. Ohio Valley Water Co.
P. U. R. 1917 C 420 (Penn.)

Pekin v. Pekin Waterworks Co.
P. U. R. 1917 C 857 (Ill.)

Re New York & Queens Electric Light &Power Co.
P. U. R. 1917 D 777 (New York 1st Dist)

Re Ashtabula Gas Company
P. U. R. D 800 (Ohio)

Re Hackensack Water Co.
P. U. R. 1917 E 178 (N. J. )

IV. Cases and Reports on the Service Charge

Meter Rent Cases.

Meek v. Consumers Electric Light &Power Co.
P. U. R. 1915 A 982 (Mo.)

Charlesworth v. Omro Electric Light Co.
P. U. R. 1915 B 13 (Wis)

Apple v. Brazil
P. U. R. 1915 C 582 (Ind)

Bosshard v. Hussa Bros. Light & Water Co.
P. U. R. 1915 E 588 ( Wis.)

Bloomington Gas Co. v. Albert W. Holmes
Illinois Circuit Court
American Gas Light Journal April 2, 1872 Vol. 16 p. 104.

Kauffman v. Hillsboro Light & Power Co.
P. U. R. 1916 E 379 ( Wis.)

Service Charge, etc.

In re Ladysmith Lighting Co.
P. U. R. 1915 A 1065 (Wis.)

Le Roy v. Pavilion Natural Gas Company
P. U. R. 1916 D 137 (New York) (2d)

State of Louisiana v. Sloan
Louisiana Supreme Court
P. U. R. 1916 E 1015

Moritz v. Edison Electric Illuminating Co.
P. U. R. 1917 A 407 (New York 1st. Dist.)

Ben Avon Borough v. Ohio Valley Water Co.
P. U. R. 1917 C 420 (Penn.)

Pekin v. Pekin Waterworks Co.
P. U. R. 1917 C 857 (Ill.)

Re New York & Queens Electric Light &Power Co.
P. U. R. 1917 D 777 (New York 1st Dist)

Re Ashtabula Gas Company
P. U. R. D 800 (Ohio)

Re Hackensack Water Co.
P. U. R. 1917 E 178 (N. J. )

Kennedy v. De Kalb Sycamore Electric Co.
P. U. R. 1917 E 312 (Ill.)

Re New Jersey Gas Company
P. U. R. 1918 B 448 (N. J. )

Re Lockport Light, Heat & Power Co.
P. U. R. 1918 C 732 (New York 2d Dist)

Re Pacific Power & Light Co.
P. U. R. 1918 D 671 (Idaho)

Re Green Bay Water Company
P. U. R. 1918 F 75 (Wis)

Re Board of Water Commissioners, City of Madison
P. U. R. 1918 F 83 (Wis.)

Kinch v. Concord Light & Power Company
P. U. R. 1918 F 836 (N. H.
P. U. R. 1919 B 884
(Given in P. U. R. as D - 434) Ann.

Re Electric & Water Utilities of Eugene
P. U. R. 1918 F 836 & 12 Rate Research 51 (Oregon) Ann.

Re City Light & Traction Co. (Sedalia)
P. U. R. 1918 F 940 and 949 (Missouri)

San Francisco v. Spring Valley Water Co.
P. U. R. 1919 A 427 (Calif.)

Aberdeen Central Labor Council v. North Pacific Pub. Ser. Co.
P. U. R. 1919 B111 (Washington)

Re Bronx Gas & Electric Co.
P. U. R. 1919 B433 (New York 1st Dist)

Re Ocean County Gas Co.
P. U. R. 1919 B 878 (N. J.

Light Committee v. Penn Central Light & Power Co.
P. U. R. 1919 B 882 (Pennsylvania) Ann.
Pa. Vol. 3 p. 890

Cumberland County Gas Co.
P. U. R. 1919 B 884 (N. J.) Ann.

Re Standard Gas Co.
P. U. R. 1919 B885 (N. J.) Ann.

Wilkins v. Claremont Gas Light Co.
P. U. R. 1919 C 772 (N. H.)

Re Utah Gas & Coke Company
P. U. R. 1919 D 663 (Utah)

Sag Harbor v. Long Island Gas Corporation
P. U. R. 1919 E 164 (N. Y. 2d Dist.)

Re Lima Natural Gas Co.
P. U. R. 1919 E 168 ( Ohio)

Sellersville v. Highland Gas Co.
P. U. R. 1920 A 322 (Penn.)

Re Springfield Gas & Electric Co.
P. U. R. 1920 A 472 (Ill.)

Schaub v. Mechanicsburg Gas & Water Co.
P. U. R. 1920 B 258 (Penn.)

Fox v. Pine Grove Electric Light, Heat, & Power Co.
P. U. R. 1920 B380 (Penn.)

Heckert v. Heggins Water Co.
P. U. R. 1920 B 395 (Penn.)

Re Fulton Fuel & Light Co.
P. U. R. 1920 E122 (N. Y. 2d)

Maires v. Flatbush Gas Co.
P. U. R. 1920 E1018 and 1029 (N. Y. 1st.)

Town Board v. St Lawrence Transmission Co.
P. U. R. 1920 F 217 (N. Y. 2d. )

Graves v. Iroquois Natural Gas Co.
P. U. R. 1920 F 576 (N. Y. 2d.)

Hartford v. Hartfod City Gas Light Co.
P. U. R. 1920 F 840 (Conn.)

Re Sea Cliff & Glen Cove Gas Company
P. U. R. 1921 A216 (N. Y. 2d)

Re Rochester Gas & Electric Corporation
P. U. R. 1921 A 418 (N. Y. 2d.)

Re Kingston Gas & Electric Co.
P. U. R. 1921 B 84 ( N. Y. 2d Dist)

Borough of Auburn v. Eastern Penn L. H. & P. Co.
P. U. R. 1921 B197 (Penn)

Re Dixon Water Co.
P. U. R. 1921 B 564 (Ill.)

City of Meriden v. Meriden Gas Light Co.
P. U. R. 1921 B 618 (Conn.)

In re Portland Gas Light Co. U 288 Maine
P. U. R. 1921 B 670 (Me.) Ann.

In re Kewaskum Elec. Light Co.
P. U. R. 1921 B 671 (Wis.) Ann.

Hempstead v. Nassau & Suffolk Ltg. Co.
P. U. R. 1921 B 681 (N. Y. 2d. Dist) Ann.

Re Warrensburg & P. S. Waterworks Co.
P. U. R. 1919 A 452 ( Mo.) Ann.

Re Columbus Gas Light Co.
P. U. R. 1920 F 616 (Indiana)

Beloit v. Beloit Water Gas & Elec. Co.
16 Wis. 196

Re Application La Crosse Gas & Elec. Co.
2 Wis. 24

New Jersey Northern Gas Co.
N. J. Commssion Report, Vol. 5, p. 678

Milwaukee v. Milwaukee Gas Co.
12 Wis. 479 Rate Research Oct. 1, 1913

Bath v. Bath Elec. & Gas Light Co.
N. Y. 2d Dist. Case No. 6531

Cedar Valley Electric Co.
6 Wis. 782

Vancouver v. Pacific Power & Light Co.
Washington Commission 5184

Public Service Commission v. Spokane Falls Gas Light Co.
Washington Commission 5134

Re Utica Gas & Electric Co.
N. Y. Second Dist. Commission Cases 7908, 7961,7978

New Jersey Gas Co.
New Jersey Commission May 14, 1921

In re Application City of Delware
12 Wis. 158

Greensburg et al v. Westmoreland Water Co. (Pa.)
Pa. Vol. 2 p 1034

Re Clinton Light & Water Co.
9 P. S. C. Mo. 298

V. American Gas Association Information Service

No. 17 January 1921
Court Finds 22 Candle Power Standard Confiscatory on Staten Island
Bureau of Standards Reports on Washington Gas Light Company
Kansas Company Obtains Important Decision in U. S. Court

27 October, 1921
Rochester Loses Service Charge Case

28 November, 1921
The Rochester Service Charge Case

30 December, 1921
The Providence Service Charge Case

31 January, 1922
North Hempstead, New York, Service Charge Decision and its Effect

35 March, 1922
Court of Appeals Decision in the Rochester Service Charge Case

40 February, 1923
Kansas Public Utilities Commission Upholds The Three Part Rate

44 August, 1923
Important Decision of Judge Denison, Circuit Judge, and Judges Tuttle and Simons, District Judges, Sitting as a Statutory Court for the Eastern District of Michigan

47 April, 1924
United States District Court in AlAbama Renders Important Decision in the Mobile Gas Company Case

49 May, 1924
Important Decision on Valuation of Utility Property Rendered by Supreme Court of Penn.

51 June, 1924
Statutory Rate Making and Statutory Gas Service Standards Set Aside - Legislative Action Severely Criticized - Rates Declared Confiscatory by Federal Court - New York

54 October, 1924
Valuation Based on Present Day Costs Upheld in Atlanta Gas Rate Case by Special Master. 10 Per Cent Going Value Allowed

56 December, 1924
Dollar Gas and 650 B. t. u. Law Invalid-Consolidated Gas Company of New York Entitled to Earn at Least Eight Per Cent on Full Present Value of Property

57 April, 1925
Estimated Reproduction Costs in Uncontradicted Evidence Cannot be Arbitarily Reduced, Says United States Supreme Court

Special Master in Brooklyn Case Makes Important Report

Change in Federal Procedure on Final Hearing in Rate Cases Becomes Effective May 13th

58 May, 1925
Wins Right to Earn Eight Per Cent on Present Value - New York

Retirement Reserves Should Not be Deducted From Reproduction Cost in Fixing Present Value - New York.

Right of Gas Company to Fix and Promulgate Reasonable Rates Sustained in Michigan

59 July, 1925
Three Federal Court Decisions Sustain Right of Gas Companies to Eight Per Cent Return

60 August, 1925
Reasonableness and Justice of the Service Charge Sustained and Forcibly and Clearly Discussed by Missouri Supreme Court - Valuation Must Include Consideration of Costs at Time of Inquiry - Going Value Must be Allowed

62 December, 1925
Court Holds Eight Per Cent Return Must be Allowed Upon Adequate Sums for Working Capital, Undistributed Structural Costs and Going Value

63 February, 1926
Significant Decision in Utility Case

65 April, 1926
Valuation Principles for Utilities Reaffirmed in Important Decisions of Special Statutory Courts

66 May, 1926
Two Notable Decisions of U. S. Supreme Court
The Mobile Gas Company Case
The New Jersey Telephone Case

67 August, 1926
Three Part Gas Rate Approved by Georgia Body

68 October, 1926
Another Federal Court Allows 8 Per Cent Return
Brooklyn Borough Gas Company

70 December, 1926
U. S. Supreme Court Decides Three Gas Cases

Clarifies Whole Subject of Valuation

71 January, 1927
Brooklyn Borough Gas Company Allowed 8 Per Cent Return on Present Reproduction Cost When Federal Court Applies Indianapolis Water Decision

Recent Decisions of the United States Supreme Court Affecting Procedure in Rate Litigation

72. March, 1927
Alabama Commission Declares Cost of Service is Correct Foundation of Rate Structures

Wisconsin Supreme Court Applies Present Fair Value of Property Following United States Court of Last Resort

73 April, 1927
Modern Scientific Rate Making Clearly Explained by Alabama Commission

Text of Notable Decision

Muscle Shoals Gas Company

Appendix A

Some Important Dates in the Gas Industry

| | |
|---|---|
| 1609 | Van Helmont named Gas |
| 1660 to 1670 | Dr. Clayton confined natural gas in beef bladders |
| 1792 | William Murdock invented gas lighting |
| 1804 | Winsor obtained first English patent for gas making apparatus |
| 1805 | Murdock built gas works and lighted the cotton mill of Messrs. Phillips & Lee at Manchester |
| 1806 | Winsor laid the first gas mains in a public street |
| 1812 | First gas company in the world organized |
| 1812 | David Melville introduced gas lighting in Newport, Rhode Island |
| 1815 | First gas meter invented by Clegg |
| 1816 | First gas company incorporated in the United States at Baltimore, Maryland |
| 1822 | Gas lighting introduced in Boston August 19, 1822 beginning of the Boston Consolidated Gas Company |
| 1849 | Boston Meter Works Organized |
| 1855 | Invention of the Bunsen Burner |
| 1884 | Welsbach Mantle invented |
| 1896 | Incandescent gas mantle applied to street lighting |

Appendix B

Important Dates in the Development of Rate Theories

Adapted from" Where We Stand in Rate Making for Gas and Electricity" by J. M. Spitzglass in the 1916 Proceedings of the Pacific Coast Gas Association

1. Contract System

2. 1874 London Sliding Scale

3. 1891 Walton Clark Customer Charge

4. 1892 Dr. John Hopkinson Readiness - to- Serve

5. 1896 W. J. Greene First Analysis of Customer, Demand, and Outward Charges (Electric)

6. 1896 Arthur Wright The Wright Demand System (Electric)

7. 1900 Henry L. Doherty The Three Part Charge (Electric)

8. 1900 The Foresee (4C) System Capacity Charge and Current Charge (Electric)

9. 1904 Frank W. Frueauff Adaptation of the Three Rate Charge to the Gas Industry

10. 1905 Alfred E Forstall Partial Subdivision of Investment Expenses

11. 1906 W. H. Gardiner Additional Business Theory

12. 1908 Public Utility Commissions Cost of Service Theory

Wisconsin Railroad Commission

Gas and Electric Commissioners of Massachusetts, 1910

13. 1910 S. E. Doane Basis for Subdivision of Expenses (Electric)

14. 1913 Alton O. Miller Customer, Demand, and Output Principles as Applied to Gas

15. 1914 Rate Research Committee Value of Service (Electric)

16. 1914 and 1915 National Commercial Gas Association Value of Service

17. 1918 New Hampshire Public Service Commission In the Case of D434 Charles Kinch et al v. Concord Light and Power Company Approves Service Charge Form of Rate after a careful and scientific investigation of rates

18. 1921 American Gas Association Rate Structure Committee of 1921 Endorses Service Charge form of Rate Structure

Massachusetts Department of Public Utilities Endorses Service Charge form of Rate Structure

19. 1924 The Executive Board and Advisory Board of the American Gas Association state " It is essential that the companies be permitted to adopt rate schedules based on sound and logical analyses, and proper allocation of all expenses, including a fair return. We believe that the adoption of the three part rate already endorsed by the American Gas Association is essential."

20. 1927 Three Part Rates Approved by the Georgia Public Service Commission

21. 1927 Alabama Commission Declares Cost of Service is Correct Foundation of Rate Structures

Modern Scientific Rate Making Clearly Explained by Alabama Commission